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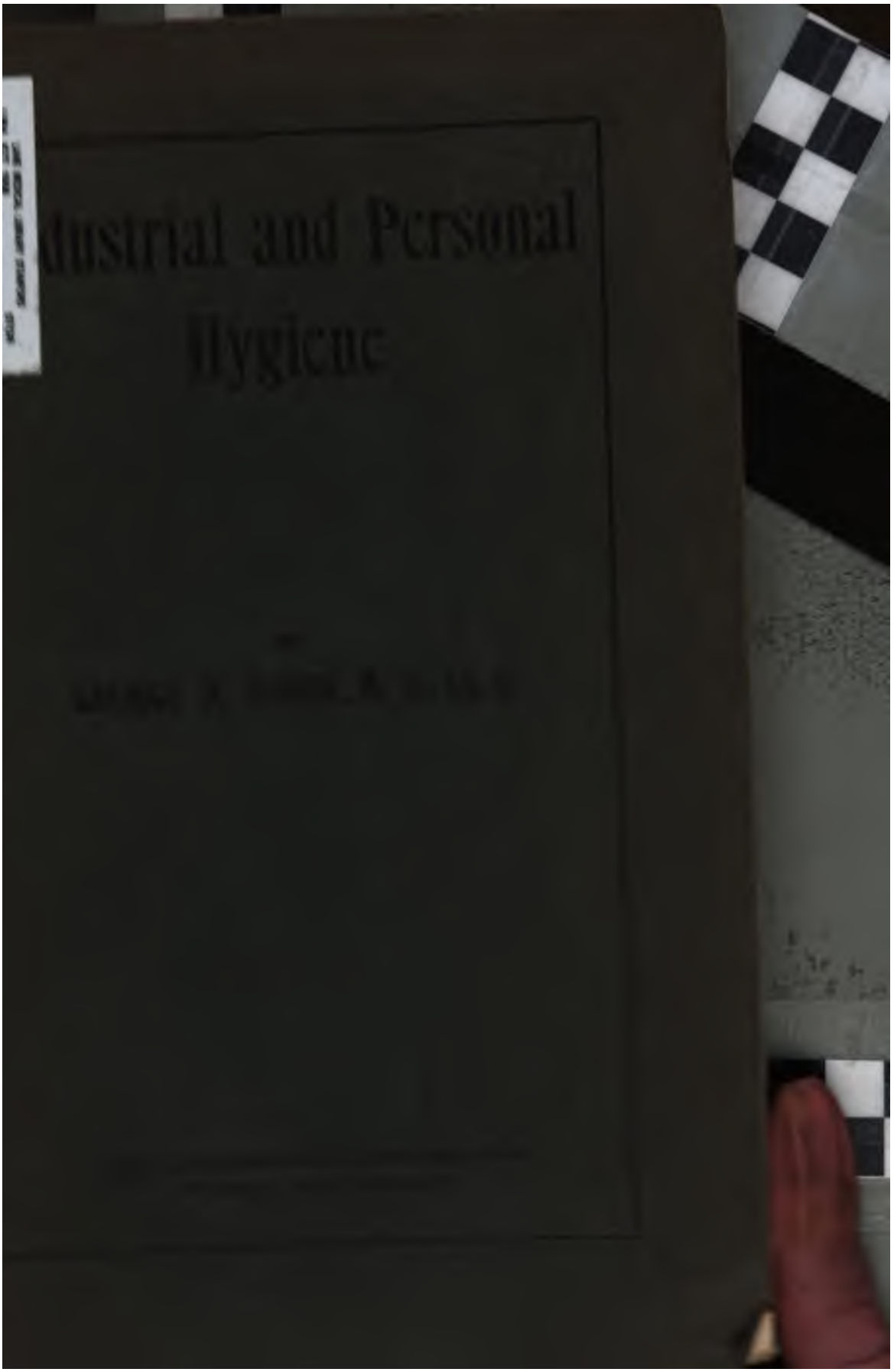
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Hygiene

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1908

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INDUSTRIAL AND PERSONAL HYGIENE

BY

GEORGE M. KOBER, M. D., LL.D.

Chairman of the Committee on Social Betterment of the President's Homes Commission, Professor of Hygiene, School of Medicine, Georgetown University

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A REPORT OF THE COMMITTEE ON SOCIAL BETTERMENT

PUBLISHED BY
THE PRESIDENT'S HOMES COMMISSION
WASHINGTON, D. C.
1908

The President's Homes Commission,

Appointed by President Theodore Roosevelt

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WASHINGTON, D. C.
February 4, 1908.

TO GENERAL GEORGE M. STERNBERG,
Surgeon-General U. S. A. (Retired),
Chairman of the President's Homes Commission,
Washington, D. C.

SIR—The Committee on Social Betterment finds it difficult, if not impossible, to elaborate plans for the amelioration of present standards of living among the least resourceful people without a full consideration of the relations of certain occupations to the health of those engaged therein. The question of health is intimately connected with the physical, social and moral welfare of the human race and plays an important role in the prosperity of countless numbers of our fellow beings, whose only income is the product of their daily labor. It will be readily conceded that health is the chief asset of the workingman, and that no greater calamity can befall him than when his earning capacity is impaired, or arrested, by reason of sickness or disability. It means, in many instances, the utter financial ruin of the family and is doubtless one of the most potent causes of want and poverty. The truth of this statement is being more and more appreciated, and well directed efforts are being made everywhere to prevent, as far as possible, the fundamental causes of poverty and distress. In this the medical profession has been a helpmate to religion. Men who come in daily contact with sickness and distress can not fail to experience deep sympathy for their fellow men, which is all the more profound when they realize that many of the diseases are preventable, and much of this terrible suffering cruelly unnecessary. These tender feelings inspired by a desire to render a service to humanity have stimulated into existence a science which has for its object not only the promotion and preservation of health, but also the prevention of disease.

In the search for the causes and prevention of diseases the interests of the wage-earners have not been neglected; indeed, it may be truly said that a special department has been created, known as Industrial Hygiene or Social Medicine, with a most complete and satisfactory literature of its own. German authors, in 1897, issued a volume of over 1,200 pages, and English authors, under the editorship of Dr. Thomas Oliver, devoted 891 pages to "Dangerous Trades"—"The Historical, Social and Legal Aspects of Industrial Occupations as

Affecting Health." The writer, during his visit to Berlin in September, 1907, met Dr. E. J. Neisser, who had just completed an "International Review of Industrial Hygiene," covering a volume of 352 printed pages. Dr. Neisser deplored his inability to present a general review of the work accomplished in the United States for the promotion of the welfare of the wage-earners, since, with the exception of the reports of the Inspector of New Jersey, no recent data concerning factory sanitation were available for publication. Realizing the importance of the subject, not only to wage-earners, but to all interested in the conditions under which our fellow men and women live and work, an effort has been made in the succeeding pages to supply this information.

It is, indeed, a feeble attempt towards amelioration of existing conditions, when compared with the monumental volumes of German and English authors. The writer acknowledges his indebtedness to Dr. Neisser for the inspiration given him by his own good and unselfish work, and also to all authors consulted by him, and to whom credit is given in the text.

It is hoped that this study of the causes of sickness and the means of promoting industrial efficiency and earning power, will fill one of the obligations which your Committee assumed to discharge.

Respectfully submitted,

GEORGE M. KOBER.

INDUSTRIAL AND PERSONAL HYGIENE.

BY GEORGE M. KOBER, M. D.

Part I—INDUSTRIAL HYGIENE.

INTRODUCTION.

One of the most interesting and beneficent subdivisions of hygiene is a study of the relations of occupations to health and longevity. The necessity for devoting special attention to this subject was shown long ago by observations that certain occupations and trades are dangerous to health, and hence in the interest of wage-earners and the public at large it is clearly desirable to study these relations, to determine the sources and significance of the dangers, and the possible means for the prevention or the mitigation of the injurious effects.

A pioneer study was made by Professor Ramazzini, of Padua, as early as 1700, and his monograph was translated into English in 1705, and also into French in 1777.

In 1810 the French Government issued a decree relating to "etablissements dangereaux, insalubres et incommodes," and in 1815 the English Parliament instituted a commission to inquire into the condition of factories, etc. In 1822 Mr. C. Turner Thackrah, of Leeds, wrote a monograph "On the Effects of the Arts, Trades, and Professions, and of Civic States and Habits of Living on Health and Longevity." In 1833 and 1865 the English Parliament again appointed commissioners, and in 1839 the "Academie des sciences morales et politiques de France," and subsequently Bavaria, Prussia, and the German Empire directed similar investigations. As a result of these efforts and numerous independent investigations, it is known today that persons habitually engaged in hard work, especially in factories and indoors, present a greater amount of sickness and higher mortality than persons more favorably situated, and that the character of the occupations influences to a great extent not only the average expectation of life, but also the prevalence of certain diseases.

It is known, for example, that bronchitis, pneumonia, and tuberculosis are much more frequent in dust-inhaling occupations, and that the sharp angular particles of iron and stone dust are more liable to produce injury of the respiratory passages than coal, flour, grain, and

other kinds of dust. It is also known that workers in lead, mercury, arsenic, phosphorus, poisonous dyes, etc., suffer especially from the injurious effects, and that other occupations, such as mining, railroading, and those which necessitate working with or around moving machinery involve special danger to life and limb.

For these reasons workers in many industries need special protection, and in order to render this efficient it must be provided for by the enactment and enforcement of suitable laws. In 1833, 1864, 1867, and 1870, England enacted the so-called "factory laws." France provided a child labor law in 1841 and in 1874 a more satisfactory labor code. Germany and other continental governments enacted suitable legislation between 1859 and 1886.

According to Miss S. S. Whittelsey's "Essay on Massachusetts Labor Legislation," child labor received attention in Massachusetts as early as 1836. The first law as regards safety and sanitation was enacted in that State in 1877, since which time all the States and Territories have enacted some form of labor or factory laws.

OCCUPATIONS AND MORTALITY.

According to the United States Census for 1900, of 360,739 males, ten years of age and over, dying in the United States during the census year, 278,147, or 77%, were reported as having a gainful occupation. Of females, ten years of age and over, there were 324,075 deaths and 45,491, or 14%, were reported as having a gainful occupation. In the aggregate the table on page cclx gives information as to the mortality by occupations for 5,575,745 males and 1,587,874 females.

The death rates by occupation groups are as follows:

Occupation—Males.	Population	Deaths.	Death Rate. 1900.	1890.
All occupations	5,575,745	83,815	15.0	13.8
Professional	203,104	3,109	15.3	15.7
Clerical and official	424,781	5,716	13.5	9.8
Mercantile and Trading	493,994	6,000	12.1	12.3
Public entertainment	87,888	1,350	15.4	14.5
Personal service, police and military	149,164	1,931	12.9	15.4
Laboring and servant	800,893	16,158	20.2	22.6
Manufacturing and mechanical industry	1,796,928	24,769	13.8	13.0
Agriculture, transportation and other out-door pursuits	1,528,241	24,196	15.8	12.1
All other occupation	90,662	586	6.5	. . .
Females.				
All occupations	1,587,874	13,203	8.3	10.5
Nurses and midwives	41,912	397	9.5	11.2
Servants	403,801	6,920	17.1	18.2

Each of the eight large groups of occupations is subdivided, and detailed information is given in sixty specified groups of employment

for males, and in fourteen groups for females, of which we have produced only two for females, on account of their high death rate.

Unfortunately we have no reliable occupation mortality statistics and never will have, until greater attention is given this subject by health officials and the Census Bureau.

In view of the importance of the subject and the tendency elsewhere towards a more detailed classification and information for industries and trades, Mr. Frederick L. Hoffman [1] says: "It was reasonably to be expected that the Census report of 1900 would materially increase the number of specific occupations dealt with in the section discussing the relation of occupation to mortality, but instead of 89 employments discussed in the Census of 1890, only 60 are dealt with in detail in the Census of 1900. To make this matter worse, the details are not given in the fundamental tables, but a vast majority of heterogeneous employments are grouped in a purely arbitrary manner, filling space to no advantage, and resulting in conclusions of no practical value."

He very properly objects to grouping together miners and quarrymen, because according to the Census of 1890 the comparative mortality figure of quarrymen was 469, while that for miners was given as 1,127; "and to combine two such unlike occupations is the mere production of a figure which has absolutely no determining value, but the use of which must lead to false and mischievous conclusions." For like reason he objects to the grouping together of fishermen, oystermen, sailors and pilots, which he very properly regards as three well-defined groups of employment. The mortality figure in the Census of 1890 for fishermen and oystermen was 543, for pilots it was 630 and for sailors 2,276. Many other combinations of employments, such as hotel keepers and boarding-house keepers, or saloon keepers with restaurant keepers are objectionable, as it does not enable the student of social questions to determine the effects of alcohol upon longevity. If, for example, restaurant keepers, who very generally do not engage in the liquor traffic, had not been combined with saloon keepers, bartenders, etc., the death rate of this group might not be so favorable but be more in accordance with the excessive mortality rates observed in this class in other countries. Mr. Hoffman points out that during the five years 1891-1895, during a condition of peace, the death rate of the U. S. Army was 6.6 per 1,000, and for the Navy 8.3 per 1,000, and concludes from this, that soldiers and sailors should not have been combined. We quite agree with him, as there is reason to believe that the factor of environment, such as close sleeping quarters and damp-

[1] Quarterly Publication of the American Statistical Association, December, 1902, p. 172.

ness, influence the life of sailors adversely. He also refers to a number of misleading occupation death rates, because no correction is made for the difference in age distribution in widely different employments. As a result "the published rates do great injustice to employments, entirely healthy, while giving favorable position to employments the health conditions of which are quite the opposite. This point is readily illustrated, if comparison is made of the mortality of farmers and printers, the former of which according to the Census, experienced a mortality 'at all ages' of 17.6 per 1,000, against a death rate of 12.1 per 1,000 for printers. Hence, apparently, printers enjoy a much lower mortality than farmers. Of course the opposite is the case. The inaccuracy of the rates is the result of radical differences in the age distribution of the two employments, there being 11.5% of farmers at ages 65 and over, while among printers there are only 1.5% living at this age period. * * * When proper comparison is made the mortality in farmers is considerably below that of printers at all periods of life."

Mr. Hoffman's suggestions for improving vital statistics are worthy of careful consideration. The present Chief Statistician of the Division of Vital Statistics, Dr. Wilbur, is a trained physician, a keen student of social, sanitary and industrial questions, and perfectly familiar with the literature and the results achieved by more accurate and scientific methods of the treatment of the subject elsewhere. We may, therefore, confidently expect more definite data concerning the relative danger incident to various occupations.

MORBIDITY AND MORTALITY OF WAGE-EARNERS.

The statistics of the morbidity and mortality of various occupations, while far from satisfactory, and subject to more or less erroneous conclusions, nevertheless indicate that persons habitually engaged in hard work are more frequently subject to disease and present a higher mortality than persons more favorably situated; and this is especially true of factory employees, because their work is generally more monotonous, fatiguing, performed under less favorable surroundings, and they are too often also badly nourished and badly housed.

Rohe, in his "Text Book on Hygiene," presents a table of a large number of persons in the State of Massachusetts whose occupations were specified, the total number of decedents was 144,954; the average age at death was 50.90. From this tabulation it appears, that farmers and gardeners have the greatest expectation of life, with an average of 65.29 years:

Active mechanics, outdoors	56.19 years
Active mechanics, indoors	47.57 years
Inactive, mechanics, in shops	43.87 years
Professional men	50.81 years
Merchants, financiers, agents, etc	48.95 years
Laborers without special trades	47.41 years
Factors, laboring abroad, etc	36.29 years
Employed on the ocean	46.44 years
Females engaged in wage-earning occupations	39.13 years

Among the occupations usually classed as inimical to health are bleachers, bookbinders, brass founders, compositors, coppersmiths, electrotypers, stonecutters, gas-works employees, white-lead workers, match workers, persons employed in the manufacture of explosives, firemen, potters, file makers, and rubber-factory operatives.

The following table from the reports of the Twelfth Census shows the death rates per 1,000 for leading causes and for all causes in certain occupations in 1900:

DEATH RATE PER 1,000 EMPLOYEES IN CERTAIN OCCUPATIONS IN REGISTRATION STATES IN 1900, BY PRINCIPAL CAUSES OF DEATH.

Occupation.	Death rate per 1,000.						
	Tuberculosis of lungs.	Diseases of nervous system.	Heart disease.	Pneumonia.	Diseases of urinary organs.	Accidents and injuries.	All causes
MANUFACTURING AND MECHANICAL INDUSTRIES.							
Bakers and confectioners	2.50	1.60	1.02	1.17	1.45	0.61	12.3
Blacksmiths	2.12	2.99	1.90	1.68	1.90	1.00	18.3
Boot and shoe makers	1.35	1.50	1.45	.95	.78	.33	9.4
Brewers, distillers, and rectifiers	2.56	2.74	2.22	2.40	2.56	1.37	19.7
Butchers	2.87	2.30	1.77	1.72	1.36	.81	16.1
Cabinetmakers and upholsterers	3.59	2.21	1.61	1.73	1.57	.64	18.0
Carpenters and joiners	2.31	2.45	2.23	1.46	1.73	1.18	17.2
Cigar makers and tobacco workers	4.76	1.79	1.75	2.15	1.68	.70	18.7
Compositors, printers, and pressmen	4.35	1.30	.93	1.15	.93	.49	12.1
Coopers	2.99	2.90	2.72	2.09	3.08	1.36	23.8
Engineers and firemen (not locomotive)	2.29	2.08	1.80	1.77	1.66	1.83	15.7
Iron and steel workers	2.36	.91	1.01	1.81	.77	.78	10.7
Leather makers	3.11	1.01	1.26	1.32	.84	.66	12.3
Leather workers	2.27	2.67	2.11	.97	2.27	.97	17.5
Machinists	1.95	1.24	1.03	1.10	.98	.71	10.5
Marble and stone cutters	5.40	1.10	1.59	1.37	.83	.99	14.9
Masons (brick and stone)	2.93	2.26	2.32	2.30	1.83	1.57	19.9
Mill and factory operatives (textiles)	2.07	.84	.90	.80	.57	.75	8.8
Millers (flour and grist)	1.98	4.47	3.81	2.97	1.16	1.98	26.6
Painters, glaziers, and varnishers	3.19	2.13	1.69	1.54	1.82	1.28	16.2
Plumbers and gas and steam fitters	2.94	.90	.59	1.13	.88	.76	9.1
Tailors	2.18	1.43	1.28	1.13	1.38	.51	11.8
Tinners and tinware makers	3.65	1.77	1.26	1.37	1.31	.91	14.5
AGRICULTURE, TRANSPORTATION AND OTHER OUTDOOR.							
Draymen, hackmen, teamsters, etc	2.61	.89	.95	1.47	.90	1.33	11.0
Farmers, planters, and farm laborers	1.11	2.70	2.62	1.49	1.70	....	17.6
Miners and quarrymen	1.20	....	....	.77	....	3.78	9.6
Steam railroad employees	1.29	.95	.88	.60	.64	4.10	10.8

The following table from the report of the registrar-general of England and Wales shows the comparative mortality of occupations

in England and Wales 1890-1892. The average mortality of all males of the population between 25 and 65 years of age was placed at 1,000. The mortality of occupied males was 953 and of the unoccupied 2,215. The comparative mortality of the different groups was as follows:

Occupation.	Comparative mortality.	Occupation.	Comparative mortality.
Clergymen, priests, ministers.....	533	Bricklayer, mason, builder.....	1,001
Gardener, nurseyman	553	Butcher	1,096
Farmer, grazier	563	Printer	1,096
Schoolmaster, teacher	604	Plumber, painter, glazier.....	1,120
Grocer, etc.	664	Cotton manufacturer, Lancashire	1,176
Carpenter, joiner	783	Carman, carrier	1,284
Barrister, solicitor	821	Slater, tiler	1,322
Fisherman	845	Brewer	1,427
Shopkeeper	859	Innkeeper, hotel servant.....	1,659
Medical practitioner	966	Potter, earthenware manufacturer	1,706
Tailor	989	File maker	1,810

A reasonable explanation for the excessive mortality in some of the occupations will be found in subsequent pages; the high rates in brewers, innkeepers, and hotel servants are believed to be due to the effects of alcohol.

According to Rauchberg[1] the average number per 1,000 members of the "Vienna Sick Benefit Society" taken sick during a period of 17 years was 423 per annum distributed as follows:

Occupation.	Average number taken sick per 1,000 members.	Occupation.	Average number taken sick per 1,000 members.
Assistant machinists	488	Iron workers	351
Factory employees & day laborers	477	Shoemakers	343
Foundrymen	473	Tinners and bronzers.....	339
Blacksmiths	451	Cabinetmakers and wood workers	326
Masons and stonecutters.....	437	Saddlers	282
Painters	378	Tailors and furriers.....	215
Weavers and spinners.....	367	Other mechanics	463
Locksmiths	354		

Industrial diseases and industrial accidents are everywhere assuming more and more importance and our knowledge should be based upon accurate data. In countries like England, where reports of certain occupations are compulsory, it is quite possible to secure, for example, reliable data as to the number of cases of lead poisoning. The same may be said of the facilities afforded by the statistics of the "German Industrial Insurance Institutes," which furnish not only the number of deaths, but also the number of cases treated, together

[1]Die allg. Arbeiter-Kranken und Invalidencasse in Wien, 1886.

with the age period and the duration of the disease. Similar facts should be collected in this country. This is all the more important when it is remembered that even with the most complete statistics, it is extremely difficult to determine *all* the factors which influence the health and longevity of operatives. Great differences are found in the conditions under which the work is performed, some of which are entirely avoidable, while others are not, and it is hardly fair to characterize certain trades as dangerous, when experience has shown that no harm results when proper safeguards have been taken. In the consideration of this question the personal element of the workmen, their habits, mode of life, food, home environments, etc., can not be ignored. There are a number of occupations in which the alcohol habit prevails to an unusual extent, perhaps because of the character of the work, perhaps as a result of association, and it would not be fair to attribute the ill health of the operatives altogether to the character of the employment. Again, many persons are engaged in occupations for which they are not physically fitted, while others ruin their health by vice, dissipation, improper food, and insanitary environments at home. In addition to all this there are factors, such as water and soil pollution, for which neither the industry nor the individuals are primarily to blame. Thus, for example, the general anæmia of the agricultural classes in Porto Rico was attributed a few years ago to their occupation and starvation, when as a matter of fact it was caused by the "hook-worm disease." Recent investigations conducted by Doctor Stiles appear to indicate that the same disease prevails to some extent among the textile operatives in the South. All this indicates the need of a thorough study of the conditions affecting health in various occupations, not only to determine the relative health risks and the causes of the undue prevalence of certain diseases in certain occupations, but also to formulate rules which may remove the causes or render the system better fitted to resist them. In this, as in all preventive efforts, a hearty co-operation of the parties interested is absolutely essential for the attainment of the highest measure of success. In this instance the responsibility rests with the State, the employer, and employees; each have certain duties to perform, and the help of all is essential for the mitigation of existing evils.

INDOOR OCCUPATIONS.

Indoor employment, broadly speaking, is inimical to health, while outdoor work in a pure air favors health and longevity. Without underrating the influence of insanitary dwellings, improper and

insufficient food, lack of recreation, and other factors, there is no doubt that one of the chief dangers of indoor life is exposure to vitiated air. The air of dwellings and workshops is never as pure as the outer air, because it is polluted by the products of respiration, combustion, and decomposition, and the presence of individuals also tends to vitiate the air with dust, germs, and organic matter from the skin, mouth, lungs, and soiled clothing. Unless proper provision is made for the dispersion of foul air and the introduction of pure air there is much reason for assuming that these impurities play a more or less important role in what has been designated as "crowd poisoning," characterized in the acute form by symptoms of oppression, headache, dizziness, and faintness, while the chronic effects of deficient oxygenation and purification of the blood are plainly evinced by the pallor, loss of appetite, anæmia, and gradual loss of physical and mental vigor. All of these effects are intensified when human or animal beings are obliged to occupy rooms with an air supply insufficient for the proper oxygenation of the blood, and as a result of this habitual exposure to vitiated air, we note an undue prevalence of consumption in crowded workshops, dwellings, prisons, public institutions, and formerly also in military barracks and battle ships. Even live stock shows the baneful effects of insufficient air space for tuberculosis among the range cattle of the far west, which are practically without shelter, is comparatively rare, while it affects from 15 to 25 per cent. of dairy herds, which are housed, but without sufficient regard to light and air. Improved ventilation and increased air space has everywhere lessened the death rate, and it is chiefly by just such measures that the rate from consumption has been reduced from 11.9 to 1.2 per 1,000 in the British armies. As a matter of fact, an abundance of pure air has been found the most important factor in the treatment of tuberculosis, because it promotes oxygenation of the blood, stimulates the appetite and nutrition, and thereby increases the general resisting power of the system.

OCCUPATIONS INVOLVING EXPOSURE TO IRRITATING DUST.

It has long been known that dust-inhaling occupations predispose to diseases of the respiratory passages, which may result in consumption. The particles of mineral dust produce an irritation of the mucous membrane of the nose, throat, respiratory organs, and eyes, and the hard, sharp, and angular particles of iron and stone dust may cause actual abrasions. According to Arnold[1] the dust which is

[1]Untersuchungen ueber Staubinhalation, etc., Leipzig, 1885.

inhaled lodges on the mucous membrane of the air passages and vesicles of the lungs, there to be coughed up, although some of the finest particles are taken up by the epithelial cells and white corpuscles and carried to the nearest lymphatic glands. The coarser particles, such as iron, stone, or coal dust, usually lodge upon the surface to be coughed up with the secretions. If not expectorated they will cause harm by clogging up the air vesicles and interfere with respiration. In the meantime not infrequently an irritation is set up, causing catarrhal conditions of the mucous membrane, or a more serious chronic inflammation of the respiratory organs, so common among persons engaged in dusty occupations. The chronic inflammatory conditions thus produced favor infection with the tubercle bacillus. At all events Hirt's statistics show that men employed in dust-producing occupations suffer much more frequently from pneumonia and consumption than those not exposed to dust and that there is practically no difference in frequency of disease of the digestive system. The relative frequently of these diseases per 1,000 workmen is as follows:[1]

CASES OF CONSUMPTION, PNEUMONIA, AND DIGESTIVE DISORDERS PER 1,000 WORKERS IN CERTAIN OCCUPATIONS.

	Consumption.	Pneumonia.	Digestive disorders.
Workers in metallic dust	28.0	17.4	17.8
Workers in mineral dust	25.2	5.9	16.6
Workers in mixed dust	22.6	6.0	15.2
Workers in animal dust	20.8	7.7	20.2
Workers in vegetable dust	13.3	9.4	15.7
Workers in nondusty trades	11.1	4.6	16.0

Perlen in his "Inaugural Dissertation," Munich, 1887,[2] discussed the records of the Munich Polyclinic, where 65,766 persons were treated between 1865-1885, including 4,177 tuberculosis patients, viz., 2,801 males, 1,263 females, and 83 children. Of these, 1,425 patients had been engaged in occupations where they were exposed to dust, viz:

30 per cent were by reason of occupation exposed to metallic dust.
26 per cent were by reason of occupation exposed to vegetable dust.
18 per cent were by reason of occupation exposed to mineral dust.
17 per cent were by reason of occupation exposed to mixed dust.
8 per cent were by reason of occupation exposed to animal dust.

According to the reports of the Census of 1900 the consumption death rate of marble and stonecutters in the United States is six times that of bankers, brokers, and officials of companies, and the mortality in fifty-one other employments ranges between these extremes.

[1]Cited by Harrington, Practical Hygiene, 1902, p. 678.
[2]Cited by Uffelmann, Handbuchd. Hygiene, 1890, p. 587.

The amount of dust is perhaps less important than the character of the particles which compose it. The susceptibility to consumption in metal workers and stonecutters can only be explained by the fact that the hard, sharp, and irregular particles of this kind of dust are more apt to produce injury of the mucous membranes of the respiratory tract. But it is not fair to assume that the less irritating dust is free from danger, for as pointed out by E. Roth[1] even the inhalation of plaster of Paris or flour dust can not be regarded with indifference, especially when it is preventable.

Ahrens[2] found the amount of dust for each cubic meter of air in certain industrial establishments as follows:

	Mg.		Mg.
Horsehair works	10	Flour mill	28
Sawmill	17	Foundry	28
Woolen factory	20	Polishing room of foundry	71.7
Woolen factory with exhauster	7	Felt shoe factory	175
Paper factory	24	Cement works	224
Laboratory	1.4		

According to Schuler and Burkhardt, cited by Roth, the morbidity among 1,000 workmen engaged in dusty occupations is as follows:

Bookbinders	98	Paper factory employees	343
Silk weavers	205	Mechanical industrial shops	419
Cotton spinners	235	Wood turners	427
Printers	250	Laborers in the rag storeroom of a paper factory	429
Cotton weavers	285		
Type founders and typesetters	304		

According to Sommerfeld, cited by Roth, the mortality in Berlin of persons engaged in nondusty occupations is 2.39 per 1,000; of persons engaged in dusty occupations is 5.42 per 1,000; the mortality of the Berlin population at the same ages is 4.93 per 1,000.

Of 1,000 deaths the number of deaths from consumption in occupations without development of dust was 381; in occupations with development of dust it was 480; in the Berlin population at the same ages 332.3.

METALLIC AND MINERAL DUST.

It will be readily understood that in the cutlery and tool industry, especially in the grinding and polishing departments, more or less dust is evolved not only from the metallic surfaces, but also from the numerous grindstones, and emery and corundum wheels. This dust production is not wholly avoidable, even when the wet process is employed. It is known that occupations involving the inhalation of this dust tend to produce diseases of the lungs, such as bronchitis, peribronchitis and fibroid pneumonia, but tuberculosis, also spoken

[1]Kompendium der Gewerbekrankheiten, Berlin, 1904, p. 106.
[2]Archiv fur Hygiene, 1894, Heft 2.

of by the workmen as "grinders asthma" and "grinders rot" leads the list.

Moritz and Roepke[1] have shown that 72.5 per cent. of the deaths among the metal grinders of Solingen are due to consumption, as compared with 35.5 per cent among the general population.

The death returns for 12 years of the city of Northampton, Mass., one of the centers of the cutlery and tool industry, show that among "grinders," "polishers," and "cutlers" diseases of the lungs were responsible for 72.73 per cent of the mortality inclusive of 54.5 per cent of deaths from tuberculosis.[2]

Hirt gives the percentage of consumption in the total number of sick among different classes of workers in metal as follows: Needle polishers, 69.6 per cent; file cutters, who are also exposed to inhalation of lead, 62.2 per cent; grinders, 40 per cent; nail cutters, 12 per cent.

Greenhow[3] over 50 years ago called attention to the excessive mortality among the needle polishers of Sheffield. Beyer[4] found that of 196 needle polishers at Remscheid only 24 were over 40 years of age. The reason why this occupation is especially dangerous, is because the "wet process" can not be employed for small objects, which moreover have to be brought more closely to the eyes, and thus the chances for the inhalation of this metallic dust are increased.

The danger in all such establishments can be reduced to a minimum by the employment of respirators and forced ventilation to carry the dust away from the operator. The Massachusetts report, cited above, states that "even when employers have provided hoods, connected with a system of exhaust fans or blowers, a very large proportion of grinders recklessly remove the hoods, and thus expose themselves unnecessarily to this especially dangerous form of dust. They assert that they prefer freedom of movement, with dust, to the protection offered by hoods."

Stonecutting is regarded as a dangerous occupation, and consumption is quite common among men engaged in the industry. Those who have witnessed the various operations realize that in spite of wet processes, and employment in the open air, the workmen are exposed to a great amount of this irritating form of dust, especially those who operate the pneumatic tools.

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[1]Cited by Roth, p. 26.

[2]Report of the State Board of Health of Massachusetts upon the sanitary condition of factories, workshops, etc., 1907, p. 87.

[3]Cited by Sander, Handbuch der oeffnetl. Gesundheitspflege, 1885, p. 106.

[4]Beyer, Die Fabrikindustrie des Reg. B. Duesseldorf, 1876.

A collective investigation published in 1901, and cited by Roth[1] shows that of every 100 deaths among stonecutters, polishers, and quarrymen 86 were due to diseases of the lungs, inclusive of 55 deaths from consumption. Of 2,013 stonecutters examined by Sommerfeld, 19.7 per cent were afflicted with consumption; 17.98 per cent with other diseases of the lungs, and nearly all had a chronic catarrh of the throat or larynx.

According to the report of the Board of Health of Massachusetts, previously cited,[2] of 343 deaths which occurred in the city of Quincy, Mass., among stonecutters during a period of about 16 years, 41.4 per cent were due to pulmonary consumption; 12 per cent to other diseases of the lungs; 12.8 per cent to diseases of the heart; 7 per cent to violence and 26.8 per cent to all other causes.

Mr. Frederick S. Crum[3] calls attention to the excessive average mortality rate from consumption, 205.4 in Barre, Vt., which he attributes to the stone cutting industry.

Millstone and slate cutting are also regarded as dangerous occupations. Persons engaged in glass cutting and polishing are not only exposed to the inhalation of a sharp and irritating dust, but also to lead poisoning from the use of putty powder, which contains 70 per cent of lead oxide. In glass establishments in Massachusetts, where all the cutting and polishing is done by the wet method, no dust is perceptible and the employees as a class appear to enjoy good health. Gem finishers also have a high consumption and sick rate. Workers in mica dust and bronzing powders used in the manufacture of wall papers, fancy souvenir cards, moldings, frames, etc., are predisposed to diseases of the respiratory passages, and the bronze powder in addition is liable to produce headache, loss of appetite, nausea, vomiting, and diarrhea.

It is said of the bronzing department of some of the lithographing establishments in Massachusetts, that in spite of the exhaust ventilation the air is heavy with bronze dust most of the time.[4] "The boys who run the fine bronzing machines wear handkerchiefs over the nose and mouth. They look pale and unhealthy, and all show the characteristic green perspiration due to contact with bronze. The great majority of the employees appear to be healthy."

In the manufacture of machinery and metal supplies some of the

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[1]Kompendium der Gewerbekrankheiten, Berlin, 1904, p. 108.

[2]Page 79.

[3]Quarterly Publication of American Statistical Association, December, 1907, p. 465.

[4]Report of the State Board of Health of Massachusetts upon the sanitary condition of factories, workshops, etc., 1907, p. 80.

operations involve exposure to dust, fumes, vapors, or extreme heat. In some of the processes, where emery wheels and revolving wire brushes are used, enormous amounts of fine steel and emery dust are given off, unless equipped with exhaust ventilating appliances. In a Massachusetts investigation covering 24 establishments the air of some of the rooms was found exceedingly dusty and about one-tenth of the occupants looked pale and sickly, and complained of the irritation of the air passages by the dust. The number of employees in these establishments ranges between 12,500 and 15,000. Some of the establishments were models in character as regards light, ventilation, and general sanitation. "The tumblers and emery wheels are provided with hoods and blowers which are effective and there is practically no dust. The rooms in which castings are dipped are properly ventilated and all fumes are effectively removed. All of the machinery is well protected."

One brass foundry was reported where the air was heavy with fumes, especially in winter, no mechanical ventilation being installed, and in which the workmen have occasional attacks of "brass founders' ague." The following may be taken as a fair statement of the hygienic aspects of the machinery and metal industry: "While the nature of some of the processes is such as to warrant classification of this industry with the dangerous trades, the conditions under which the work is done are very largely responsible for the injurious effects on the health of the employees, and these conditions are to a considerable extent avoidable or at least susceptible of improvement."

The same Massachusetts investigation covered 14 iron and steel foundries and 9 stove foundries. In one establishment, the department in which the castings are sand blasted was found very objectionable, as the air was heavily impregnated with flying sand, which "gets into the mouth, nose, and eyes and the employees suffer considerably from soreness of the last-mentioned organs." In another establishment this condition is very much ameliorated by a large flaring hood in the center of the room with upward-suction draft, the operatives wearing helmets with fine wire inserts to protect the eyes, and cloths underneath the helmets to protect the nose and mouth. In one of the stove foundries, "the dust from the polishing and buffing process, in the absence of hoods and exhaust ventilation, is so thick that objects a few feet distant can not clearly be made out. Many men refuse to work in this establishment in the hot months on account of the excessive heat and general discomfort. In some instances, however, where the necessary protection is afforded by the employer, the men habitually remove the hoods and become covered with emery and iron particles."

In the crushing, grinding, and sifting process incident to the manufacture of emery, corundum, and sandpaper more or less fine dust is given off in spite of the fact that the machines are more or less completely inclosed. The emery and corundum industry must be classed among the trades intrinsically dangerous to health, on account of the peculiarly irritating character of dust. But as is the case with other dusty occupations, few of those employed can be induced to wear respirators.

Coal miners, charcoal men, firemen, chimney sweeps, etc., are exposed to constant inhalation of coal dust and soot, and though subject to chronic bronchial catarrh, consumption is not especially common among them.

VEGETABLE DUST.

Millers and bakers inhale flour dust, and according to Hirt 20.3 per cent of all the diseases in millers are pneumonia, 9.3 per cent bronchial catarrh, 10.9 per cent consumption, and 1.9 per cent emphysema (abnormal collection of air in the lungs). The tuberculosis death rate according to Schuler among millers in Switzerland is 3.75, as compared with 2.95 per 1,000 in the general population. Carpenters, joiners, cabinetmakers, etc., are exposed to wood dust, and the dust from hard wood is probably more injurious than that from softer kinds. Dr. E. J. Neisser[1] refers to a wooden-tool factory at Strasburg which in 1904 furnished 15 cases of sickness out of the 20 employees, with 288 days loss of work, distributed as follows—diseases of the eyes, 1; of nose, 1; throat, 2, and diseases of the lungs, 6. The Massachusetts Board of Health found that in the agricultural tool and implement industry a hard wood called "coca-bola," which is used for tool handles, evolves a very pungent and irritating dust, productive of inflammation of the eyes and skin. Some persons in the course of a week or two, become accustomed to its effects, while others are obliged to discontinue work in the department.[2]

The medical inspector of Great Britain, according to Neisser, reported a number of toxic symptoms which occurred among persons engaged in the manufacture of weaver shuttles made from African boxwood. Investigation revealed the presence of an alkaloid in the wood, which acted as a heart depressant, producing a slow and intermittent pulse; headache, drowsiness, watering of the eyes and nose, difficulty in breathing, nausea, and weakness.

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[1]Internationale Uebersicht ueber Gewerbehygiene, Berlin, 1907.

[2]Report of the State Board of Health of Massachusetts upon the sanitary condition of factories, workshops, etc., 1907, p. 89.

Laborers in grain elevators and grain threshers inhale a very irritating dust, which may cause acute and chronic catarrh of the mucous membranes. Workers in tobacco suffer more or less from nasal, conjunctival, and bronchial catarrh and digestive and nervous derangements, and although the mucous membranes gradually become accustomed to the irritation of the dust and fumes the occupation appears to be dangerous, as the consumption rate ranks next to that of stonecutters.

It is said that female workers in tobacco are more liable to miscarry; at all events Doctor Rosenfeld, cited by Roth (p. 166), found this to be true in Austria. Dr. E. R. Tracy, of New York, reports that 325 cigar makers' families visited by him had only 465 children, an average of 1.43 to each family, and feels disposed to attribute this to the frequent abortions among the female operatives. This experience is not confirmed by recent observations made in German tobacco towns like Giessen, for example (Neisser, p. 125), and more extended investigations are called for. Some authors maintain that tobacco dust exerts a protective influence against infective agents and instance the fact that during the cholera epidemic of Hamburg in 1892 there were only 8 cases among the 5,000 resident cigar makers. The Massachusetts report previously cited in discussing the cigar and cigarette factories in Massachusetts refers (p. 49) to the spitting habit and the objectionable practice of finishing cigars with the aid of saliva. This practice was observed in more than one-third of the places visited, and in 18 factories the practice of biting off the end of the filler and inner wrappers with the teeth was also observed. The report reiterates the statement made to the legislature in January, 1905, as to the possibility of disseminating loathsome diseases, through this practice. Such conditions certainly emphasize the necessity for the use of cigar holders.

TEXTILE INDUSTRIES.

Operatives in cotton and flax textiles are perhaps more subject to dust inhalation and various diseases of the respiratory and digestive organs than those of woolen mills. The Census Report of the United States for 1900 gives the death rate among 150,783 male mill and factory operatives (textiles) as 8.1 per 1,000, and of the 162,932 female operatives as 4 per 1.000. As pointed out by Mr. F. L. Hoffman it would have been exceedingly interesting to learn the death rate among cotton, linen, wool and silk workers. The phthisis death rate in 1892 in Belfast [1] with its 30,000 persons engaged in the linen industry

[1] G. H. Ferris, Journal of State Medicine, March, 1895.

was 4.1 per 1,000 against 1.4 for the whole of England and Wales and 2.1 for Ireland. According to Schuler and Burkhardt 1,000 linen spinners furnish annually 221.6 cases of sickness; 1,000 weavers 202.7, while female operatives suffer even more, the sick rate being 249.5 and 334.4 for the respective occupations.

CASES OF SICKNESS PER 1,000 EMPLOYEES AMONG SPINNERS AND WEAVERS.

Disease.	Cases per 1,000 spinners.	Cases per 1,000 weavers.
Diseases of the digestive organs	58.7	103.4
Diseases of the respiratory organs	47.7	52.5
Diseases of the motor organs	29.6	21.2
Diseases of a constitutional character	22.9	31.6

Arlidge[1] gives a table showing the comparative frequency of the most important diseases in the case of 739 weavers, and of 676 persons following the several other branches of the cotton industry, such as winders, spinners, reelers, curlers, mill hands, grinders, etc., and who for convenience sake are designated by him as machine-room workers. The figures are based on 1,415 operatives who received treatment as in and out patients in connection with the Preston Hospital during a period of six years.

Disease.	Per cent of weavers treated for specified disease.	Per cent of machine-room workers treated for specified disease.
Phthisis	9.87	11.90
Dyspepsia	16.50	21.00
Bronchitis	32.34	31.30
Varicose veins and ulcers	11.23	6.80
Rheumatic affections	7.70	11.68
Uterine disorders and displacements	8.24	8.43
Neuralgia	2.84	4.43
Throat affections	1.89	2.51
Renal diseases	2.57	2.66
Epilepsy	1.49	3.40
Heart diseases	2.71	5.32
Debility	7.57	9.17
Anaemia	2.43	2.50

It will be observed that the Swiss and English statistics both reveal an undue prevalence of the diseases of the respiratory and digestive organs. It has been suggested that the constrained position of weavers is to a large extent responsible for the undue prevalence of dyspepsia among the Swiss weavers, but other factors like improper food, indoor life, and home conditions should be considered. This is apparent from the fact that the percentage of cases of dyspepsia among the English

[1]Arlidge, "The Hygiene, diseases, and mortality of occupations," London, 1892, p. 361.

weavers is smaller than among the machine-room workers. The constitutional disorders like anæmia, chlorosis, neuralgia, and debility are likewise due to a variety of causes, chief of which are vitiated air, resulting from defective ventilation of the workshops, overwork, insufficient or improper food, and insanitary homes.

Uterine derangements and displacements may very properly be attributed to general debility, overwork, and long standing in hot and moist workrooms, and, like varicose veins and ulcers and "flat feet," may be expected to develop in other occupations involving long standing. (See occupations involving constrained attitudes.)

The undue prevalence of pulmonary diseases among the textile operators can be accounted for by a number of factors, such as the presence of very fine cotton or flax dust or "fly;" air vitiated by the products of respiration and combustion, the presence of infectious germs from the promiscuous expectoration habit; faulty life and home surroundings. Of these the presence of "fly" is doubtless a very important predisposing factor, since it is generally admitted that this dust acts as an irritant to the respiratory passages, and sooner or later prepares the way for the invasion of the germs of tuberculosis, pneumonia, etc. Coetsem describes the so-called byssinosis or "pneumonie cotonneuse," but it is by no means settled whether in these cases we have to deal with a typical occupation disease, or with a specific infection, in which the inhalation of the cotton dust simply operates as a predisposing cause. It is very probable, however, that the habitual inhalation of this dust may produce disease of the lungs not necessarily tubercular.

Arlidge says: "If inhaled longer, it reaches the bronchi, and sets up cough with white mucous expectoration. The cough will be for years chiefly a morning phenomenon on first rising, but it is also induced upon leaving the warm workroom. Fine fibers of cotton are found, on microscopical examination, in the sputum, and as these make their way into the pulmonary tissue they set up morbid action, resulting in increasing density of it on the one hand and of emphysematous expansion on the other. These morbid changes are accompanied by dyspnœa, wasting, and debility, but rarely with hemoptysis [spitting of blood], and together constitute a group of symptoms not inappropriately termed 'industrial phthisis.' Moreover, intercurrent diseases of the lungs, such as acute bronchitis and pneumonia, often arise and terminate life, and true tubercular phthisis is no uncommon cause of death."

The chief requirements for the amelioration of existing conditions in the textile industry are efficient machines for the prevention and

removal of dust. The utmost care should be taken to provide the most perfect methods so far devised for the removal of dust and for proper ventilation. The lighting should be good, both for day and night work, giving preference to electricity. The temperature and humidity of the rooms should be regulated, and children under the age of 14, or those with weak chests, should not be employed at all in the cotton mills.

In the textile industry in Massachusetts analysis of the death returns during the year 1905 from the three principal "mill towns" shows that although tuberculosis is one of the leading causes of death among mill operatives the general death rate of this class was by no means abnormally high, being, respectively, 7, 8, and 10 per 1,000. Tuberculosis caused, respectively, 32, 23.57, and 21 per cent of the deaths. It appears also that the general death rates of the cities whose population includes the highest per centage of the textile operatives compare not unfavorably with those of certain other cities which are engaged in other kinds of manufacture or are more residential in character, in spite of the high rate of infant mortality which appears to be inseparably connected with mill populations everywhere.[1]

A source of danger is the presence of infectious dust from dried sputum in the air of different mill rooms on account of the indiscriminate habit of spitting.

The report also includes an excellent summary of the results obtained by an inspection of 93 manufacturing establishments and the conditions found in a certain proportion of weave and spinning rooms are tabulated as follows: 1, Poor light; 2, Presence of carbon-dioxide and carbon-monoxide in the air; 3, Non-regulation of artificial moisture, (*a*) excess of moisture, undue heat, or (*b*) no artificial moisture, excessive heat; 4, More or less dust ("fly" dust from sizing, etc.); 5, Lack of cleanliness; 6, Lack of provision for a plentiful supply of fresh air. In the majority of mills the toilet and wash rooms were found to be beyond criticism; but in not a few "the imperative need of improvement as regards structure, location, ventilation and common decency" are pointed out. The number of accidents in textile mills, considering the large number of fast-running machines, is not large, during a period of almost five years at the Pacific Mills, with about 5,200 employees, amounting to 1,000, classified as follows:

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[1]Report of the State Board of Health of Massachusetts, 1907, p. 16.

Accidents to employees of the Pacific Mills, Lawrence, Mass., August 10, 1900, to July 13, 1905.

Killed outright	1
Fatally injured	1
Seriously injured (broken limbs or amputation necessary)	86
Slightly injured	910
Unclassified (suffered nervous shock, but physically uninjured)	2
	1,000

The underlying cause of injury is given as follows:

Careless manipulation	539
Deliberate carelessness (taking chances of being injured, such as cleaning machinery while running, etc.)	164
Inattention to surroundings	177
Carelessness of fellow-workman	51
Unforeseen liability	60
Unclassified	9
	1,000

In three mills in Massachusetts devoted to the manufacture of twine, cordage, and gunny cloth from jute and hemp some of the workrooms are reported to be exceedingly dusty in spite of mechanical ventilation and open windows. "Many of the operatives wear thick bunches of fiber over mouth and nose as a protection. A fairly large proportion of the operatives show the effects of their employment, looking pale and sickly." In the room where the sisal hemp is fed into breakers the air is filled with dust. "In one of the establishments the employees in all departments look well and strong, although the air in some parts contained considerable dust."[1]

In five Massachusetts carpet and rug factories, employing about 6,000 persons, about 10 per cent of whom are between the ages of 14 and 16, the largest of these factories shows some departments in which poor light, excessive heat, moisture, and dust constitute objectionable conditions. In one room there was "so much fine cotton dust and fiber in the air that it is with difficulty one can see across. This dust is very irritating to the nose and throat." In one of the establishments the children are described as very small and poorly developed for their age "to be allowed to work 10 hours and 20 minutes for 5 days in the week." In another factory "about one-tenth of the employees look sickly." The smallest factory employs 500 persons, "has good

[1]Report of the State Board of Health of Massachusetts upon the sanitary condition of factories, workshops, etc., 1907, p. 46.

light, adequate ventilation, and commendable weave rooms, and the employees appear to be in good health."

One of the shoddy mills examined was poorly lighted, inadequately ventilated, dusty, and ill kept; the other was light, clean, and well ventilated. "Some of the women employed appeared to be in poor physical condition. In the six felt-cloth factories examined the work was found to be conducted in fairly lighted and, apart from dust, adequately ventilated buildings. In each there was more or less dust, especially in the picking and carding rooms; but the amount was much diminished in most of them by means of blower fans."

ANIMAL DUST.

Of the several classes of dust, that from wool is considered to be less irritating than flax or cotton, and horn is believed to be more irritating than bone. The conditions found in some of the woolen mills in Massachusetts as regards light, ventilation, and general cleanliness are reported as far from satisfactory; but in the absence of morbidity statistics it is difficult to determine the degree of danger to which the operatives are exposed. In the boot and shoe industry in Massachusetts, where there is more or less animal dust evolved, some effort is being made to remove the dust by exhaust flues attached to the machinery. Of the 373 factories summarized by the Massachusetts Board of Health Report previously cited, "126 are partially, and a fair proportion of these are wholly, equipped with this means of protection; in 88 of these 126 one or more machines are not so equipped; and in 49 of the 88 there are rooms in which the air, apart from the escaping dust, is noticeably bad. The number of machines with means for efficient or fairly efficient removal of dust was found to be 1,630; the number either inefficiently equipped or devoid of equipment was reported as 2,769. * * * While in general the health of the employees appears to be fair to good, in 85 factories a considerable proportion of them are noticeably pale and unhealthy in appearance." The pale and poorly nourished condition of youthful employees is also emphasized.

The dust and moisture involved in the polishing departments of the horn and celluloid industry, and the irritating fumes given off by a "dip" containing glacial acetic acid, are sources of possible injurious effects to the employees.

In the manufacture of derby and felt hats, apart from the exposure to dust from the fur which comes to the factory clipped from the skin, there is also a certain degree of danger from cyanide of mercury

with which the fur is treated. In four felt-hat factories inspected by the Massachusetts Board of Health, "the employees appeared to be healthy." In some of the establishments visited the fumes of wood alcohol in the drying department were markedly strong. "The workmen stated that they are frequently troubled with headaches, vertigo, smarting and burning of the eyes, and impairment of vision, and that few can remain at this work longer than three or four months at a time." This could readily be prevented by the use of "denatured" alcohol. In the "pouncing process," which consists in smoothing off the rough hairs from the hat rim and other parts, "a great deal of very fine dust is given off."

Mr. Frederick S. Crum[1] gives the mortality rate from consumption in Orange, N. J., as 289.9 as compared with the average of 151.0 for the 200 small cities investigated by him, and attributes this excess to the fact that in 1905 there were 1,379 employees engaged in the felt-hat industry in Orange.

In the brush-making industry hogs' bristles and vegetable fibers are used. In seven brush factories in Massachusetts "the general conditions were found to be beyond criticism and the health of the employees appeared to be fair or good."

Hirt regarded brush making as a dangerous occupation, as nearly one-half of the deaths among the brush makers were from consumption, due probably to the inhalation of the sharp fragments of bristles.

There are no adequate reliable data as to effects of animal dust given off in the manufacture of woolen goods, silk, feather, fur, hair, horn, bone, shell, ivory, etc. It is reasonable to assume, however, that the dust from all these sources is capable of setting up an irritation and inflammation of the respiratory passages, though not as intensive as that caused by mineral constituents of dust. In the hair, brush, and wool industry there is also some danger from disease germs.

OCCUPATIONS INVOLVING EXPOSURE TO INFECTIVE MATTER IN DUST.

RAG, PAPER, WOOL AND HAIR INDUSTRY.

It has been held for a long time that germs of infectious diseases like smallpox, anthrax, scarlet fever, tuberculosis, typhus and typhoid fever, diphtheria, measles, and cholera may cling to body and bed clothes and prove a source of danger to those coming in contact with

[1]Quarterly Publication of the American Statistical Association, December, 1907, p. 464.

rags in the rag business and paper industry.[1] The danger while perhaps overrated, is nevertheless real and can be guarded against only by a thorough disinfection of the rags by steam under pressure before they are handled at the paper mills.

The occupation is evidently inimical to health. Of 4,857 German operatives reported by Uffelmann, 50 per cent are annually taken sick; about 34 per cent of those engaged in the handling of dry rags suffered from affections of the respiratory passages, and only 21.9 per cent of those otherwise engaged in the same establishments, all of which speaks strongly for the necessity of proper ventilation and exhaust flues for the removal of dust.

In this connection it is proper to refer to the dangers of the so-called "rag sorters'" and "wool sorters'" disease, which are nothing more or less than anthrax infection—a disease transmissible from animals to man by means of wool, hides, hair, and horsehair. Two hundred and sixty-one cases with 67 deaths, were reported, according to Neisser, in England from 1899-1904. Of these, 88 occurred among those engaged in the wool industry, 70 cases among persons engaged in curled-hair and brush factories, 86 in persons engaged in tanneries and hide trades, and 17 in other industrial pursuits.

About 59 cases of anthrax infection were reported in different parts of Europe during the year 1905. Ravenal reported in three localities in Pennsylvania, during the summer of 1897, 12 cases among men and 60 in cattle, which were traced to a tannery handling imported hides from China. Nichols reported 26 cases occurring in persons employed in a curled-hair factory within three years.

The General Government recognizes the dangers by insisting upon the exclusion of rags, wool, and hides coming from infected districts during the prevalence of cholera, anthrax, and typhus fever and their proper disinfection at all times. While anthrax is not a very common disease among American domestic animals, local pustular infections and carbuncle are by no means infrequent, and might well be guarded against, as in some of the European countries, where recourse is had to disinfection of the raw material, special blower apparatus for the removal of dust, repeated disinfection of the premises, and prompt treatment of all slight wounds and abrasions.

The material from which paper is made includes rags, burlap, old paper, and wood pulp. The rags are chiefly imported from foreign countries, arriving in a baled condition, and after opening are sub-

[1]The State of Maine requires evidence of successful vaccination in persons engaged in the rag industry or those employed in the manufacture of paper from foreign and domestic rags.

jected to a number of processes for the purpose of cleaning and disintegration. The "beating, thrashing," and "chopping" process is carried on by machines and is attended by the escape of more or less dust. The quantity naturally varies with the cleanliness of the stock. In the observations of about 80 establishments, the Massachusetts Board of Health found that with the usual grade of stock, no matter what kind of "duster" or "thrasher" is used, a considerable amount of dust is also evolved in the "chopping" process, and in spite of exhaust fans and dust pipes some dust will escape. The men engaged in the collection and baling of this dust are usually provided with respirators. In a majority of the mills visited a proportion of the employees are exposed to an excessive quantity of dirt, dust, and lint, and in most of this majority the persons so exposed show not a few who are pale and sickly in appearance. A comparison of the death rate from tuberculosis, pneumonia, and bronchitis at Holyoke, the center of this industry in Massachusetts, with those of the State at large, showed "that the Holyoke rates were under rather than over the average."[1]

OCCUPATIONS INVOLVING EXPOSURE TO POISONOUS DUST.

LEAD DUST.

All occupations in which lead is employed and in which particles of lead may be inhaled, swallowed, or absorbed by the skin must be regarded as dangerous to health. Lead poisoning in its various forms, such as the lead habit, characterized by loss of weight, anæmia, sallow skin, a blue line along the gums, offensive breath, a sweetish taste and diminished salivary secretion, lead colic, lead paralysis, wrist drop, painful affections of the lower extremities, and other grave nervous diseases, is frequently seen in artisans. It attacks persons employed in the roasting of lead ores, in the manufacture of white and red lead, acetate and chromate of lead, china and pottery, artificial flowers; also painters, plumbers, varnishers, type founders, typesetters, file cutters, glass and gem cutters, electricians (especially those employed in charging storage batteries), persons engaged in enameling, dyeing, printing, working in rubber goods, weighted silk, and glazing of paper, and many other occupations involving the employment of lead.

Doctor Teleki, of Vienna, in 1906 reported several cases of lead poisoning in females and young girls, contracted in fringe making, the silk having been weighted by a solution of sugar of lead.

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[1]Report of the State Board of Health of Massachusetts upon the sanitary condition of factories, workshops, etc., 1907.

Of 999 employees in Prussian lead smelters during the year 1905, 177 suffered from lead colic or lead palsy, involving 3,056 days' loss of work; and of 4,789 engaged in zinc smelters, 50 of the employees, with 2,217 days' loss of work, were thus affected.

In Europe a most marked reduction in the morbidity and mortality has taken place during the past ten years, coincident with the enforcement of preventive measures. The number of cases of lead poisoning in England, where report is compulsory, has been reduced from 1,278 cases in 1898 to 592 cases in 1905. While most of the cases occurred in sugar-of-lead works and potteries, a considerable number were also reported in the other occupations already referred to. The percentage of severe cases in men was 23.9, as compared with 13.9 in females—perhaps because the latter have cleaner habits and possibly also stop work more promptly upon the appearance of the first symptoms.

In Paris it is estimated that over 30,000 persons are engaged in occupations involving exposure to lead, and of the 14,000 painters and varnishers employed there an average of 250 are treated annually in the hospitals for lead poisoning.

File cutters are not only subjected to an irritant dust, but also to lead poisoning, because the file in cutting is being held upon a leaden bed "and particles of lead are inhaled with the dust and may also be absorbed by the fingers in handling the stiddy." The mortality figure for plumbism, in 1890-1892, was no less than 75.[1]

The greatest danger in lead works is from inhalation of the lead dust and fumes; hence a special spray apparatus and exhausters have been designed, and employees have been taught to protect their hands with gloves and the mouth and nose with respirators.

In the pottery industry, where the danger arises from the glazes, the flux being made of litharge, clay, and flint, it has been found that the danger can be very much reduced by using only 8 per cent of carbonate of lead in the form of a "double-fritted silicate," instead of the older method, in which from 13 to 24 per cent of lead carbonate was employed.

Smoking should be forbidden during the working hours, and the work should be done in a special suit, frequently washed. The hands, face, and nostrils should be thoroughly washed with soap and water upon cessation of work, and the mouth and throat rinsed with a watery solution of tartrate of ammonia before eating and drinking. The same rules are applicable to painters, who would likewise find it of benefit to soften old paints with an alkali (weak lye) before scraping and to keep the handles of tools clean from deposits.

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[1]Dangerous Trades, Oliver, 1902, p. 138.

THE LEAD INDUSTRY IN MASSACHUSETTS.

The report of the Massachusetts Board of Health[2] gives a very complete account of the conditions which obtain in the manufacture of lead compounds in the several factories visited. "The men who attend the grinding machines are of a very different class from those who empty the stacks, and since they are not exposed to lead dust they do not suffer from lead poisoning and are comparatively healthy. Those who empty the stacks do not remain long at work. It is said that this is due in part to the disagreeable nature of the work, in part to the fact that they are largely roving characters, who do not care to work more than a few days occasionally, and in part to the fact that they acquire lead poisoning and are obliged to quit. Even those of good intentions rarely work more than a month."

One establishment is referred to where white lead is made by the "wet process," with no evolution of dust, and there is no history of lead poisoning. In a "red-lead" factory, also, the general process is commended, especially the absence of appreciable amounts of dust, and the intelligence of the workmen, who are mindful of the dangers and who, with an experience of 6 to 25 years, appear well and strong. In one of the lead-oxide works more or less dust escapes into the air during the transfer to the mill and packing it into barrels. The men wear respirators, and each man washes carefully and changes all his clothes before leaving the establishment. In another establishment "all of the 40 employees appeared to be in good health, and the conditions everywhere were found to be commendable."

In the lead-pipe and plumbers'-supplies factories the lead fumes are carried away by hoods and exhaust pipes, and in no instance was it possible to trace a case of lead poisoning to faulty methods. All of the employees observed the necessary precautions and appeared to be in good health. In the manufacture of solder the same precautions are employed, and although in the establishment described, rats, cats, and dogs appear to succumb to lead poisoning, only one case of lead poisoning occurred among the employees in 35 years.

In the pottery industry it is said that lead poisoning is almost unknown in the six establishments visited; only two cases occurred a few years ago in girls who applied the glaze. A possible explanation for this gratifying contrast to conditions observed in French and English potteries may be found in the fact "that the persons engaged in this industry appear to be of good intelligence and understand thor-

[1] Page 99.

oughly the importance of care and strict personal cleanliness, and that the employers provide ample means for its maintenance."

Wire and wire-cloth making as carried on in some of the plants visited in Massachusetts appears to be attended, in the opinion of Doctor Hanson,[1] by "avoidable dangerous conditions." "After the wire is hardened by being run into crude oil, it is passed through kettles of molten lead inside the tempering furnaces and is then finished and wound for shipment. From the tempering furnaces dense blue fumes arise and envelop the men whose work it is to feed and tend them. Occasional cases of lead poisoning occur in this department. In one establishment one of the employees of 5 years' experience shows the characteristic blue line of lead poisoning on the gums, and another of 14 years' experience, in the same room, has a history of 'wrist-drop' and other evidence of chronic poisoning. Efficient mechanical ventilation is most necessary in this work, but it is not always provided."[2]

Doctor Hanson, evidently referring to the same factory, writes: "All of the employees in this room worked 11 hours a day and had irregular hours for eating. There were no rules concerning the duties of the employers or those of the persons employed in order to avoid this serious danger. On the contrary, the hoods and blowers and top ventilators for the lead and other fumes were found to be distinctly inefficient, and over one large furnace there was no protection of any sort, the appliances having been broken years before and none renewed, so that all the fumes mingled at once with the air of the room."

In making shingle stains pigments like chromate of lead, zinc oxide, iron oxide, and Prussian blue are used, and in the two establishments visited the men appeared to be careless in the matter of handling the pigments.[3] In the manufacture of paints, colors, and varnishes much of the work is done outdoors by men who have worked from 6 to 20 years; the man who makes the lead colors has worked 17 years without sickness.[4] The last cases of poisoning at this establishment occurred 16 years ago, when a number of inexperienced men were poisoned with Paris green. In a color and mordant factory where anilin colors, logwood, starch, sodium dichromate, etc., are used, "about one in five of the employees is noticeably pale and sallow, and inflamed eyes were not uncommon." The latter condition is ascribed to the sodium dichromate. In the manufacture of "whiting" about half of the 58 men employed in three establishments visited "looked to be in poor condition."

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[1] "The effect of industry on health," Boston Med. Journal, No. 14, April 4, 1907, Wm. C. Hanson.

[2] Report of the State Board of Health of Massachusetts, 1907, p. 91.

[3] Page 106. [4] Page 107.

PRINTERS, TYPE FOUNDERS, AND TYPESETTERS.

The mortality of printers in England is high, being 1,096 per 10,000, as against 953 for all occupied males and 602 for agriculturalists.[1] According to Schuler, of 1,000 Swiss typesetters and founders, 304.7 are annually taken sick, and of printers 250. Diseases of the digestive organs predominate (78 per 1,000). Diseases of the respiratory passages come next (75 per 1,000). Sommerfeld states that among 38 occupations tabulated by him the printers occupy the fifth rank in the number of deaths from tuberculosis. Albrecht reports that the statistics of the Berlin Sick Benefit Insurance Company covering a period of 33 years show that 48.13 per cent of the deaths among printers are caused by consumption.[2]

This may be due in part to the fact that many weaklings engage in this occupation, but the work itself is often performed in most unfavorable environments and in an impure and dusty atmosphere, which has been found to contain traces of lead, arsenic, and antimony. Special attention should be paid to proper ventilation, and particularly to the collection and removal of dust from the type cases. One gram of this dust has been found to contain 57.7 mgr. of lead, 186.8 mgr. of antimony, and traces of arsenic.[3] Strasesr has suggested a type case with perforated tin bottom which is placed within another case, so as to facilitate the collection and proper disposition of this injurious form of dust.

A recent study of the "Health of Printers" by George A. Stevens, in the Twenty-fourth Annual Report of the Bureau of Labor Statistics of New York, based on the records of the International Typographical Union and the London (England) Society of Compositors, shows clearly the very high death rate from tuberculosis among printers.

The following table gives for the years 1901 to 1905 the annual death rates per 1,000 from the leading causes and from all causes among compositors in certain localities.

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[1]Dangerous Trades, Oliver, p. 151.
[2]Roth Kompendium der Gewerbe-Krankheiten, Berlin, 1904, p. 56.
[3]Rueszahegyi, Archiv, fuer Hygiene, III, p. 522.

ANNUAL DEATH RATE PER 1,000 FROM PRINCIPAL CAUSES AND ALL CAUSES AMONG COMPOSITORS IN CERTAIN LOCALITIES, FOR THE FIVE YEARS, 1901 TO 1905.

[From Twenty-fourth Annual Report of the Bureau of Labor Statistics, 1906.]

	Death rate per 1,000.							
	Tuberculosis of lungs and other respiratory organs.	Pneumonia.	Diseases of nervous system.	Diseases of genito-urinary system.	Diseases of the heart.	Diseases of digestive system.	Accidents and injuries.	All causes.
New York City..	3.82	2.42	1.91	1.63	1.37	0.99	0.89	16.32
Other New York State	2.54	.97	1.49	.70	1.67	.97	.61	11.14
Total New York State	3.48	2.03	1.89	1.38	1.45	.98	.82	14.94
Chicago, Ill.	2.42	1.57	1.04	.98	1.44	.45	.72	10.12
Philadelphia, Pa.	3.65	.70	2.26	.70	1.39	.52	.....	12.35
All other United States	3.38	1.07	1.33	1.02	1.37	.74	.60	12.20
Total United States	3.34	1.30	1.44	1.08	1.39	.76	.64	12.63
London, England	3.69	.67	1.16	.51	1.97	.51	.19	12.19

A second table gives for the same period the per cent of deaths due to tuberculosis in the selected localities for compositors and for all persons 20 years of age and over. It will be seen that in all the localities the percentage of deaths due to tuberculosis is very much higher for compositors than for all persons 20 years of age and over in the same community. For New York State outside of New York City and for London, England, the percentage for compositors is more than double that for the population 20 years of age and over as a whole.

PER CENT OF DEATHS FROM TUBERCULOSIS OF THE LUNGS AND OTHER RESPIRATORY ORGANS OF PERSONS 20 YEARS OF AGE AND OVER AND OF COMPOSITORS IN CERTAIN LOCALITIES: 1901 TO 1905.

[From the Twenty-fourth Annual Report of the Bureau of Labor Statistics of New York, p. cxxv.]

Locality.	Per cent of deaths in—					
	1901.	1902.	1903.	1904.	1905.	Five years.
ALL PERSONS 20 YEARS OF AGE AND OVER						
New York City.....	17.7	17.7	17.6	16.5	17.4	17.4
Other New York State.....	11.4	10.9	10.6	10.6	10.6	10.8
Total New York State.....	14.5	14.2	14.0	13.6	13.9	14.0
Chicago, Ill.	14.9	14.6	14.5	16.0	17.0	15.4
Philadelphia, Pa. .....4.....	16.3	15.5	15.8	16.8	15.9	16.1
London, England	14.9	13.9	15.3	15.0	13.6	14.5
COMPOSITORS.						
New York City	36.5	17.0	18.2	26.6	21.1	23.4
Other New York State.....	29.2	32.3	10.5	21.4	16.0	22.8
Total New York State.....	34.9	20.8	17.1	25.5	20.1	23.3
Chicago, Ill.	26.9	28.0	28.0	7.7	33.3	23.9
Philadelphia, Pa.	43.8	50.0	7.1	13.3	35.7	29.6
All other United States.....	31.1	29.9	24.0	26.0	29.2	27.7
Total United States.....	32.3	27.8	22.2	24.4	27.2	26.4
London, England	32.0	26.2	36.4	28.2	29.1	30.2

Mr. Stevens, in commenting on the high death rate from tuberculosis among compositors, says: "Scarcely any other occupation furnishes so large a quota of victims from consumption. The domestic life of printers is parallel to that of other artisans in equal financial circumstances. As wages go in these days, they are fairly compensated for their labor, thus enabling them to have homes as healthful as may be procured by the best paid workmen in any community. Neither can it be said that compositors are ill nourished and therefore rendered more susceptible to the insidious action of tubercle bacilli. The determining cause of their susceptibility to the harmful process of the 'great white plague' lies in a different direction—to the neglect of sanitary precautions in far too many composing rooms."

With proper attention to sanitary conditions in the composing rooms the death rate from consumption could undoubtedly be very materially reduced. The excellent results that have come from improved sanitation in workrooms appear from the mortality statistics for 1905 of the National Organization of Printers in Germany. "The average membership of the union in that year was 44,236, of whom 283, or 6.40 per 1,000, died from all causes, while 134 of the total were affected with diseases of the respiratory system, from which the death rate was 3.03,[1] tuberculosis not being separated in the tabular presentation."[2]

The regulations of the Federal Council of the German Empire which control sanitary conditions in German printing houses (put into effect July 31, 1897), will indicate the means by which such low death rates have been brought about. The regulations are given in full.

I. In rooms in which persons are employed in setting up type or manufacture of type or stereotype plates the following provisions apply:

"1. The floor of workrooms must not be sunk deeper than half a meter (1.64 feet) below the ground. Exceptions may only be granted by the higher administrative authority where hygienic conditions are secured by a dry area and ample means of lighting and ventilating the rooms.

"Attics shall only be used as workrooms if the roof is underdone with lath and plaster.

"2. In workrooms in which the manufacture of type or sterotype plates is carried on the number of persons must not exceed such as would allow at least 15 cubic meters of air space (529.74 cubic feet) to each. In the rooms in which persons are employed only in other processes there must be at least 12 cubic meters of air space (423.79 cubic feet) to each person.

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[1]The corresponding death rate among compositors in New York City was 7.17; other New York State, 4.04; total New York State, 6.34; Chicago, 5.04; Philadelphia, 4.70; total United States, 5.02, and London, England, 5.50.

[2]Twenty-fourth Annual Report of the Bureau of Labor Statistics of New York; 1906, p. cxxxvii.

"In cases of exceptional temporary pressure the higher administrative authority may, on the application of the employer, permit a larger number in the workrooms for at the most 30 days in the year, but not more than will allow 10 cubic meters of air space (353.16 cubic feet) for each person.

"3. The rooms must be at least 2.60 meters (8.528 feet) in height where a minimum 15 cubic meters are allowed for each person, in other cases at least 3 meters (9.84 feet) in height.

"The rooms must be provided with windows which are sufficient in number and size to let in ample light for every part of the work. The windows must be so constructed that they will open and admit of complete renewal of air in workrooms.

"Workrooms with sloping roofs must have an average height equal to the measurements given in the first paragraph of this section.

"4. The rooms must be laid with a close-fitting impervious floor, which can be cleared of dust by moist methods. Wooden floors must be smoothly planed, and boards fitted to prevent penetration of moisture.

"All walls and ceilings must, if they are not of a smooth, washable surface or painted in oil, be lime-washed at least once a year. If the walls and ceilings are of a smooth washable surface or painted in oil, they must be washed at least once a year, and the oil paint must, if varnished, be removed once in ten years, and if not varnished, once in five years.

"The compositors' shelves and stands for type boxes must be either closely ranged round the room on the floor so that no dust can collect underneath, or be fitted with long legs so that the floor can be easily cleared of dust underneath.

"5. The workrooms must be cleaned and thoroughly aired at least once a day, and during the working hours means must be taken to secure constant ventilation.

"6. The melting vessel for type or stereotype metal must be covered with a hood provided with exhaust ventilation or chimney with sufficient draft to draw the fumes to the outer air.

"Type founding and melting may only be carried on in rooms separate from other processes.

"7. The rooms and fittings, particularly the walls, cornices, and stands for type, must be thoroughly cleaned twice a year at least. The floors must be washed or rubbed over with a damp cloth so as to remove dust once a day at least.

"8. The type boxes must be cleansed before they are put in use, and again as often as necessary, but not less than twice at least in the year.

"The boxes shall only be dusted out with a bellows in the open air, and this work shall not be done by young persons.

"9. In every workroom spittoons filled with water, and one at least for every five persons, must be provided. Workers are forbidden to spit upon the floor.

"10. Sufficient washing appliances with soap, and at least one towel a week for each worker, must be provided in or as near as possible to the workrooms for compositors, cutters, and polishers.

"One wash hand basin must be provided for every five workers, with an ample supply of water. The wash basin after its use by each person must be emptied.

"The employer must make strict provision for the use of the washing appliances by workers before every meal, and before leaving their work.

"11. Clothes put off during working hours must either be kept outside the

workroom or hung up in wardrobes with closely fitting doors or curtains, which are so shut or drawn as to prevent penetration of dust.

"12. Artificial means of lighting which tend to raise the temperature of the rooms must be so arranged or provided with counteracting measures, that the heat of the workrooms shall not be unduly raised.

"13. The employer must draw up rules binding on the workers, which will insure the full observance of the provisions in sections 8, 9, 10, and 11. In an establishment where as a rule twenty people are employed these rules shall be inserted in the general factory regulations, in accordance with section 134a of the Industrial Code.

"II. In every workroom a notice must be posted, signed by the local police authority, attesting to the correctness of the statements concerning (a) the length, height, and breadth of rooms, (b) the air space in cubic measure, (c) and the number of workers permitted in each room.

"A copy of rules 1 to 13 must be affixed where it can be easily read by all persons affected."

III. Provides for the method of permitting the exceptions named above in sections 2 and 3, and makes it a condition of reduction in cubic air space for each person employed as typefounder or compositor, that there shall be adequate mechanical ventilation for regulating temperature and carrying off products of combustion from workrooms.

For an interesting report on plumbism and the health of employees in the Government Printing Office, Washington, D. C., by Wm. J. Manning, M. D., see Appendix A. .

ARSENICAL DUST.

Arsenic is used in the manufacture of green pigments such as arsenite of copper (Scheele's green) and aceto-arsenite of copper (Schweinfurt or Paris green). These pigments are used in connection with wall paper, box and card factories, the cretonne industry, and artificial flowers, possibly also in other occupations. White arsenic is also used in the manufacture of shot, preservation of furs, and in taxidermy, and for many other purposes.

In the manufacture of arsenate of lead in Massachusetts no objectionable features were observed.[1] Reference has already been made to cases of poisoning with Paris green.

One of the factory inspectors of East London reported last year a number of cases of arsenical poisoning in persons engaged in the manufacture of a powder used in a "dip" for scabby sheep. The powder contained arsenic in large amounts and was packed in a dry state in paper boxes. Arsenical dust may be inhaled, but more frequently absorption takes place through the skin, and causes a train of symptoms, characterized by derangements of the stomach, sore mouth, dry

[1]Report of the State Board of Health of Massachusetts, 1907, p. 104.

tongue, thirst, and a burning sensation in the throat. In the majority of instances the symptoms become chronic, lasting for months and years, and terminating in a general breakdown of the system, preceded by skin eruptions, obstinate ulcers, and inflammation of the peripheral nerves.

In the prevention of injurious effects, special attention must be paid to wet processes; so, for example, the dusting of green pigments in the manufacture of artificial leaves and flowers from a dredging box is wholly unjustifiable. As a matter of fact the use of arsenical pigments should be dispensed with by the substitution of coal-tar colors. The hands should always be protected with rubber gloves, the air passages with respirators, and strict cleanliness of the skin and clothing should be observed.

OCCUPATIONS INVOLVING EXPOSURE TO IRRITATING OR POISONOUS GASES OR VAPORS.

A large number of occupations involve the inhalation of irritating and even poisonous gases and fumes. The danger may be very much reduced by proper factory sanitation, such as 1, condensation; 2, absorption by water or chemicals; 3, destructive distillation by heat in a closed vessel; 4, combustion of gases that can be burned; 5, forced ventilation and the discharge of gases into the air at a great height. In addition to these precautions much attention must be paid on the part of the operatives themselves to personal hygiene and the use of respirators. Many of the employees in so-called dangerous trades do not always avail themselves of the safeguards offered and are opposed to the use of respirators. We shall first briefly enumerate the less injurious but nevertheless irritating gases and fumes, like sulphur dioxide, hydrochloric acid and nitrous fumes, ammonia and chlorine, which in small amounts cause more or less irritation of the air passages and a tickling cough, while in a more concentrated form they are productive of acute and chronic catarrhs and constitutional symptoms.

SULPHUR DIOXIDE

This gas is believed to be a blood poison, on account of its affinity for oxygen. It is evolved in smelting works, match factories, and in the manufacture of sulphuric acid. It is also used as a bleaching agent for cotton goods and straw hats and in the preparation of hops and dried fruit. The employees, if not primarily in good health, are said to suffer from respiratory and digestive disorders, heartburn, and pain in

the stomach, and are frequently sallow and anæmic. A gradual tolerance may be established, and the danger is very slight if free ventilation is provided. When evolved in the open air, and hence largely diluted, it does not produce any injurious effects, except in very susceptible persons; indeed the people around Vesuvius told Doctor De Chaumont that the sulphur fumes are good for their health.

The Massachusetts Board of Health found that, in the straw-hat factories visited in Massachusetts, " the employees are exposed to the sulphur fumes only when the doors are opened for the removal of the stock; but they do not enter until the fumes have escaped or have been driven out." The men do not wear respirators in this or the other process of bleaching, which is done by immersion of the stock in a chemical water bath. The men who were interviewed state that "neither process causes anything more than a temporary irritation of the throat, and that many of them have worked in this department for many years."[1]

HYDROCHLORIC ACID.

Hydrochloric-acid vapors are evolved from alkali works and in the pickling process of galvanizing works or otherwise, and, apart from being destructive to vegetation around the immediate vicinity, are also very irritating, and even in small volumes may produce inflammation of the eyes and of the respiratory passages. In a more concentrated form they have produced caustic effects on the tips and edges of the tongue, ulcerations of the nasal wall and throat, bronchial catarrh, pneumonia, difficult breathing, and stupor. Lehmann[2] considers the extreme limit to which these vapors may be contained in the air 1/10 of volume per 1,000, and relates a case where even 0.5 per 1,000 produced unpleasant symptoms in a robust man. Pettenkoffer,[3] on the other hand, states that as much as 1 part per 1,000 can be borne by those accustomed to it. The workmen in galvanizing works are also subjected to fumes arising from the sal ammoniac thrown upon the molten zinc. These fumes are to some more insupportable than the acid fumes. Persons with bronchial troubles are often obliged to discontinue the work. In an investigation of three galvanizing establishments in Boston, the Massachusetts Board of Health found that in two the ventilation was efficient and the fumes were rapidly carried off. "The work-

[1]Report of the State Board of Health of Massachusetts upon the sanitary condition of factories, workshops, etc., Boston, 1907, p. 114.

[2]Lehmann: Archiv. fuer Hygiene, v. 1.

[3]Cited by Harrington.

men in all three, about 60 in all, appeared to be in good health, and asserted that beyond sneezing and coughing at times they suffered no inconvenience or discomfort."

SULPHURIC AND NITRIC ACID.

The fumes of sulphuric and nitric acids probably produce similar effects. Eulenberg[1] believes, however, that the fumes of sulphuric acid produce no special bad effects, because they sink very readily and have a great affinity for the water in the air, so that they reach the system in a highly diluted form. He also points out that the nitrous fumes generated by contact of nitric acid with metals are more injurious, in that they produce a special predisposition to bronchitis, while pneumonia and diseases of the eye have also been attributed to these gases.

The workmen should be instructed to avoid the fumes as much as possible and to anoint the lips and nose within and without several times a day. Protection should be afforded by ample ventilation, and all processes involving the evolution of irritating or poisonous fumes should be carried on in the open air or in open sheds.

According to the Massachusetts Board of Health[2] the corrosive acids are made in such a way that practically no fumes whatever escape, the work being inclosed from beginning to end. In one of the largest chemical factories in Massachusetts, where 300 men are employed, it is said that the workmen are exposed very little to poisonous or irritating fumes and dust or contact with poisonous or irritating substances. At certain points in the building acid fumes in considerable strength are constantly present, but at these points there is good overhead ventilation, and the workmen are rarely obliged to approach very near.

Among the products of the above-mentioned factories may be mentioned hydrochloric, sulphuric acid, nitric acid, acetic acid, ammonia, sodium sulphite, sodium sulphate, alum, potassium cyanide, ferrous sulphate, and other iron and sodium salts; also various salts of tin, arsenic, antimony, zinc, copper, etc.

AMMONIA.

Ammonia rarely causes any serious disturbance, except a temporary irritation of the respiratory tract, unless present in very large volumes. The amount which may be present, according to Lehmann, should not

[1]Eulenberg, Gewerbehygiene, p. 143.

[2]Report of the State Board of Health of Massachusetts upon sanitary conditions of factories, workshops, etc., 1907, p. 103.

exceed 0.5 per 1,000. A large volume has been known to cause inflammation of the eyes and bronchial catarrh, while still greater concentrations, which fortunately are rare, may produce difficult breathing and emphysema.

CHLORINE GAS

Chlorine gas is generally present in the manufacture of chlorinated lime, glazed bricks, and in bleaching operations, and is very apt to produce, when present in the proportion of 1-5 parts in 100,000 of air, a cachectic condition, asthma, bronchitis, caries of the teeth, and acne or pimples upon the face, while in a more concentrated form—40-60 parts in 100,000—it produces a violent cough and extreme difficulty in breathing.

Hirt describes these attacks as follows: "In spite of the aid of the auxiliary respiratory muscles the entrance of the air to the lungs is insufficient, and the staring eyes, the livid lips, and the cold, clammy perspiration plainly show the mortal agony of the patient. The pulse is small and temperature decreased. These phenomena disappear upon removal to the fresh air, and a few hours later the workman is found enveloped in chlorine and hydrochloric acid vapors in his accustomed place in the factory. The attacks seem to be but rarely fatal, unless the volume exceeds 60 parts per 100,000."

BLEACHING ESTABLISHMENTS.

The Massachusetts Board of Health, in its summary of five bleacheries, with about 1,200 employees, speaks approvingly of the general arrangements for ventilation and says: "The odors of bleaching powders, although observable in each of the rooms where that substance is employed, were in no case so strong as to be disagreeable or to cause discomfort. In one of the establishments the persons exposed to the lint dust which escapes during unbaling and stitching together of the cotton cloth all looked pale and sickly."

IODINE AND BROMINE VAPORS.

Iodine and bromine vapors may produce toxic symptoms. The fumes of iodine are liable to cause catarrhal conditions of the nose, eyes, and air passages, and frequent headaches, while chronic iodine poisoning produces a cachectic condition, wasting of the testicles, and loss of sexual power. Persons engaged in the manufacture of bromine

are said to suffer quite frequently with a form of bronchial asthma, dizziness, and general weakness, while concentrated vapors have been known to produce spasm of the glottis and suffocation.

Bromine preparations are used to a considerable extent in photography. Schuler[1] describes three cases, one of which proved fatal, in men who prepared "brommetyl" from wood alcohol and sulphuric acid. In all of these three cases there were pronounced symptoms of nausea, spasms, and trembling of the extremities and diminished bodily temperature.

TURPENTINE.

Turpentine vapors in excess may produce gastric and pulmonary catarrh, slow and painful micturition and bloody urine, headache, roaring in the ears, and other nervous symptoms. Schuler observed among the workers in calico printing marked emaciation, loss of appetite, rapid pulse, and more or less headache, which he attributed to the turpentine vapors. In small doses no unpleasant symptons are observed. The odor of violets in the urine is one of its remarkable effects. The use of impure turpentine for cleaning purposes has been known to produce obstinate eczema of the hand.

PETROLEUM.

Concentrated vapors of coal oil are said to produce loss of sensation, and the workmen in refineries occasionally show symptoms like those observed in drunken persons, fall into a profound sleep, or suffer from loss of memory, dizziness, headache, and chronic bronchial catarrhs. Pustular, furuncular, and eczematous affections of the hands are also quite common in persons handling this and paraffin oil. The latter is also true of persons handling creosote and tar, unless protected by impermeable gloves. The dangers from explosions in the petroleum industry must also be guarded against.

BENZINE VAPORS.

Dr. Neisser, in 1907, reports an instance where three laborers in a carpet-cleaning establishment in which large quantities of benzine had been used were found unconscious upon the floor and had to be restored by oxygen inhalation. The toxic symptoms are similar to those produced by concentrated petroleum vapors, and the danger from explosions and fire are of course even greater.

[1]Deutsche Viertelj. f. œff. Gesundheitpflege, Bd. 31, p. 696.

CARBON MONOXIDE.

Carbon monoxide, or coal gas, when present in sufficient amount paralyzes, so to speak, the red corpuscles by depriving them of their oxygen and combining with the hæmoglobin, which results in deficiency of oxygen in the blood and serious toxic symptoms, which may end in death by producing a rapid parenchymatous degeneration of the liver, spleen, and heart. This gas is often present in gas and smelting works and around coke or charcoal furnaces, and ¼ per cent by volume in the air will produce toxic symptoms, and more than 1 per cent is rapidly fatal to animal life. The workmen sometimes, though not as often as is supposed, suffer from the chronic form of poisoning, such as headache, dizziness, slow pulse, anæmia, general debility, and diseases of the respiratory and digestive organs. The acute symptoms of coal-gas poisoning are increased respiration and pulse, violent headache, dizziness, and roaring in the ears. These are soon followed by symptoms of depression, nausea and vomiting, numbness, drowsiness, muscular relaxation, paralysis, sighing respiration, slowness of the pulse and feeble heart action, dilatation of the pupils, diminished bodily temperature, and, if continued, convulsions, stertorous breathing, and death by suffocation. If death does not occur the patient is apt to suffer for some time from headache, physical and mental depression, paralysis of speech and of the sphincters, convulsive twitching, and general muscular weakness, while pleurisy and pneumonia are also frequent.

CARBONIC-ACID GAS.

The chronic effect of carbonic-acid gas has already been alluded to. Well sinkers and miners are occasionally suffocated owing to the presence of a large volume of this gas evolved from the soil and which has collected in deep shafts. It is one of the constituents of the "choke damp" in the mines and also present in cellars. It is also a product of fermentative processes, and the anæmic and debilitated conditions of miners, vintners, distillers, brewers, and yeast makers is believed to be partly due to an excess of carbonic acid, which diminishes the amount of oxygen in the air. The acute symptoms are loss of consciousness and locomotion, generally preceded by difficulty in breathing, headache, depression, drowsiness or mental excitement, sometimes convulsions. Prompt removal of the patient into fresh air will lead to rapid recovery.

CARBON DISULPHIDE.

Carbon disulphide is used in certain processes in the manufacture of vulcanized india rubber, and also in the extraction of fats, and may

produce in those constantly exposed to it headache, dizziness, impaired vision, pains in the limbs, formication, sleeplessness, nervous depression, loss of appetite, etc. Sometimes, according to Delpech and Hirt, there is cough, febrile attacks, deafness, difficult breathing, loss of memory, paralysis of the legs and lower part of the body, loss of sexual power, which has been preceded by increased sexual appetite and mental exaltation.

NAPHTHA.

Naphtha is used in the same industries, and it is not improbable that the symptoms are produced by the combined influence of the two fumes. At all events, there are a number of authenticated cases of acute naphtha poisoning characterized by dispnœa, dizziness, and mental confusion, with vomiting, palpitation of the heart, and hemorrhages in the fatal cases. Necropsies reveal evidence of fatty degeneration of the heart, liver, kidneys, and other parts. The cleaners of woolen goods, etc., with naphtha not infrequently suffer from dizziness, nausea, vomiting, headache, sleeplessness, hysteria, and symptoms resembling alcoholic intoxication. (See also Dyeing and Cleansing.)

NITROBENZOL.

Nitrobenzol, which is used in making aniline and in the manufacture of roburite and other explosives, produces headache, dyspnœa, drowsiness, dizziness, nausea and vomiting, great depression, stupor, and often terminates fatally.

The majority of workers in di-nitro-compounds in Great Britain[1] are anæmic and suffer from difficulty in breathing and general weakness. They are subject to a biweekly medical inspection and are enjoined (1) not to touch these compounds with bare hands; (2) to keep the feet in good condition, (*a*) by bathing, (*b*) by shoes in good repair; (3) avoidance of alcoholic beverages, and (4) by thorough washing of the hands before eating and change of clothing upon quitting the work.

DYEING AND CLEANSING.

Among the chemical substances employed are naphtha, gasoline, wood alcohol, ammonia, various acids, bleaching agents, iron, copper, and other salts, aniline dyes and other dyestuffs.

The Massachusetts Board of Health reported of one large establishment investigated:

[1]Cited by Neisser, 1907, p. 79.

"In the naphtha-cleansing department, in spite of mechanical ventilation, there is a strong odor of naphtha, and all of the men here employed are pale and some of them very markedly sick looking.[1] In the room in which the naphtha-cleansed goods are dried, at a temperature of about 120° F., the naphtha fumes are very strong. Although the men who bring in the goods remain but a few minutes, some have occasionally been temporarily overcome by the fumes and have shown the characteristic excitement and hysterical symptoms of naphtha intoxication. At the time of visit, the man who does most of this work had been engaged thereat for three months and had experienced no ill effects."

RUBBER INDUSTRY.

The Massachusetts Board of Health investigated 14 rubber factories with about 9,000 employees.[2] It appears that naphtha has to a great extent replaced the more dangerous carbon disulphide as a vulcanizing agent, and in 11 of the 13 factories visited the odor of naphtha was noted as only slight. In two factories it was stated that "a few girls, new to the work, show the effects of naphtha and suffer from headache and sometimes nausea and vomiting, but that such girls do not long continue at the work. Naphtha fumes sometimes bring about a condition which much resembles alcoholic intoxication, and which occurs most often in the room where rubber is spread upon cloth. New men are especially susceptible, but even old hands have sometimes to leave their work at times for a breath of fresh air. * * * In six of the factories where litharge is handled, no history could be obtained of any case of lead poisoning. In two it was stated that cases occur, but not often. All of the establishments, with one exception, were found to be well lighted and adequately ventilated."

PATENT-LEATHER INDUSTRY.

The fumes of naptha, amyl acetate, and wood alcohol which are given off in the manufacture of patent leather are dangerous. While no exact data are available, it is admitted by those in authority that many employees can not do the work on account of inability to withstand their influences.

ANILINE VAPOR.

Aniline vapor is dangerous to health when present in the air to the extent of 0.1 per cent. Hirt describes an acute form of poisoning from

[1]Report of the State Board of Health of Massachusetts, 1907, p. 109.
[2]Report of the State Board of Health of Massachusetts, 1907, p. 113.

aniline vapor, which usually results fatally. "The workman falls suddenly to the ground, the skin is cold and pale, the face is cyanotic (bluish discoloration of the skin), the breath has the odor of aniline, the respiration is slowed, and the pulse increased. The sensation diminishes from the beginning of the attack, gradually entirely disappears, and death follows in a state of profound stupor."

The milder forms are characterized by laryngeal irritation, loss of appetite, headache, giddiness, and weakness, with a rapid, small, and irregular pulse, and diminished sensibility of the skin. In some instances short convulsions have occurred. Prompt fresh-air treatment is absolutely essential.

The chronic form of aniline poisoning may affect the central nervous system, and cause lassitude, headache, roaring in the ears, motor or sensory disturbance, or it may produce digestive derangements such as eructations, nausea, and vomiting, or it may affect the skin by causing eczematous or pustular eruptions and even well-defined ulcers. Doctor Neisser (1907) reports a number of such cases either in aniline factories or in dyeing works.

The medical inspector of Clayton, England, has presented a very interesting report[1] on the effects of aniline oil in black aniline dyeing works, and also the effects upon the skin of chromic acid and the bichromates of potassium and sodium in these establishments. He visited 20 establishments and examined 200 employees, many of whom suffered from anæmia, headache, digestive derangements, heartburn, dizziness, palpitation of the heart, loss of will power, and excessive mucous secretions, all of which were attributed to the toxic effects of aniline. He recommends as safeguards: 1, Mechanical, suctional ventilation (*a*) at the machines where the cloth is being dyed, (*b*) at the machines where the cloth passes through the bichromate solution, and (*c*) at points where there is danger from the chromate dust; 2, protective clothing, and frequent washing of the working suits, lockers, and dressing rooms for street clothing; 3, special lunch rooms; 4, suitable wash rooms.[2]

WOOD ALCOHOL.

Vapors from varnishes have been known to produce blindness, due to inflammation of the nerves behind the eyeball, and partial atrophy of the optic nerve. Similar effects follow the internal use of wood alcohol, and even fatal cases have been reported in consequence of

[1] Neisser, p. 75, 1907.

[2] Cited by Neisser, p. 74.

its substitution for the pure alcohols. Doctor Neisser, in 1907, reports a large number of eczematous affections of the hands, arms, and face in furniture polishers ("polisher's itch"), which may possibly be caused by some of the impure alcohols.

CHROME PIGMENTS.

In the manufacturing and handling of chrome pigments, as in tanneries and various leather industries, a dust or vapor is involved which causes inflammation of the eyes and even ulceration of the nasal septum and elsewhere.

QUININE.

Quite a large percentage of the persons employed in the manufacture of quinine suffer from a dry form of eczema of the hands and face, which is claimed to be directly due to emanations from the boiling solution, as the disease disappears if the work is given up.

In the so-called "polisher's itch" and in the effects produced by chrome and quinine the use of rubber gloves and anointing the skin with some clean oil or grease have been found most useful.

MANGANESE.

According to Doctor Neisser (1907) a small percentage of the workers in manganese mills and dry pigments are affected with headache, dizziness, loss of appetite, constipation, loosening of the teeth, muscular pains, and general debility.

BRASS FOUNDERS.

The workers in brass foundries inhale a metallic dust or vapor of zinc or copper, or perhaps of both, which has given rise to a train of symptoms described as "brass founders' ague." The illness attacks about 75 per cent of those who are new to the work, or who resume work after an absence of a month or even a fortnight. There are more or less severe pains in the back, and general lassitude, which compels the patient to seek his bed. Usually after he has taken to his bed chilliness comes on, increasing to a decided rigor and lasting 15 minutes or longer. In the course of an hour or less the pulse beats from 100 to 120 per minute, accompanied by a tormenting cough, corresponding headache, and soreness in the chest. After the lapse of a few hours free perspiration indicates the disappearance of the fever and the patient

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falls into a deep sleep, from which he awakens with perhaps only a slight headache and lassitude. In England the men who suffer this way drink freely of milk and promote vomiting—perhaps the best treatment for copper or zinc poisoning. A chronic form of zinc or copper poisoning, characterized by oversensibility, formication and burning of the skin of the lower extremities, tactile and motor disturbance, anæmia, cough, headache, neuralgia, digestive disturbance, and progressive emaciation, is said to occur among men who have worked for a number of years in brass foundries. At present it is not possible to say whether the symptoms of brass founders' ague are due to the copper, zinc, or arsenic, or a combination of all three. Some authors believe it to be a specific infection.

ARSENICAL FUMES.

Arsenical fumes are frequently given off in smelting processes, especially copper works, and, like those of arseniuretted hydrogen, may give rise to jaundice, headache, nausea, stiffness of the joints, general anæmia, discomfort, and malnutrition. When inhaled in concentrated doses the fumes produce symptoms of nausea, vomiting, languor, drowsiness, rapid pulse, frequent micturition, and bloody urine. In serious cases the pulse becomes small and thready, skin cold and clammy, and death ensues with evident signs of cardiac paralysis.

MERCURY.

The most important of the poisonous vapors in connection with dangerous trades are mercury and phosphorus. Workers in mercury suffer greatly from the effects of mercurial poisoning, such as salivation, tremor, and nervous symptoms, and many fall victims to pulmonary tuberculosis. Miscarriages among the female employees are very common. These effects, according to Renk,[1] are due to the inhalation of mercurial vapors in badly ventilated workshops, while Wollner attributes them to the inhalation and swallowing of fine mercurial dust. Of 7,221 mirror makers at Furth during the year 1883 not less than 2,457, or 34 per cent, were taken sick, and of these 60 per cent suffered from mercurial poisoning. This danger has been practically eliminated in the mirror industry, but it is still pronounced in the manufacture of felt, thermometers, barometers, dry electric batteries, and bronzing. In Europe persistent efforts are being made to reduce the danger in these industries to a minimum, and some of the felt establishments no longer

[1] Renk Arbeiten aus dem k. k. Gesundheitsamte, V, p. 113.

use the preliminary treatment of the hair with mercuric nitrate. The 64 cases reported in Great Britain in 1906 and cited by Neisser occurred as follows: Manufacturers of electric meters, 17; thermometers, etc., 16; felt and fur industry, 13; gilding, 7; chemical works, 7; powder works, 3; lithography, 1.

As preventive measures may be mentioned the following: 1, Change of clothing before and after work; 2, weekly washing of the working clothes; 3, systematic and frequent washing of the hands, weekly sulphur baths or frequent general baths, and gargling at the close of work with a solution of permanganate of potassium; 4, limit of work to eight hours per day and thorough ventilation of the rooms—open doors and windows; 5, frequent cleaning of floors with damp sawdust and sprinkling with a solution of ammonia.

PHOSPHORUS.

In the manufacture of phosphorus matches white and red phosphorus have been used. The danger consists in the inhalation of the fumes when the white substance is used, while the red or amorphous phosphorus is neither poisonous nor easily inflammable. The gas smells like garlic. The toxic symptoms in the acute form are difficult breathing and a feeling of intense anxiety. The fumes are only given off when the air contains moisture. The milder effects of phosphorus consist of gastric and bronchial catarrhs, anæmia, and malnutrition, followed occasionally by a painful inflammation of the bones of the lower or upper jaws, due to the local action of the phosphorus, and often beginning in carious teeth or in the alveolar process of missing teeth. The disease may develop during the first months, but generally not until four or five years after the beginning of the employment, and carious teeth, with toothache, are among the first symptoms, followed by swelling of the glands of the neck, alveolar abscesses, and necrosis of the jaws. Formerly from 11 to 12 per cent. of the employees suffered. Since the use of red or amorphous phosphorus the danger has been greatly reduced. Only about 2 per cent of the operatives are now attacked.

Doctor Neisser reports that during the year 1906 several cases of phosphorus necrosis occurred in German match factories, in which the use of white phosphorus was promptly stopped.

The medical inspectors of Great Britain, from October 1, 1900, to October 1, 1905, reported only 11 cases of phosphorus necrosis, the reduction being attributed to improved factory sanitation.

The medical inspector of Belgium (quoted by Doctor Neisser, page

71) reports that during the last six years only one case of necrosis occurred, and the morbidity of the employees in match factories has also decreased coincident with factory sanitation, as shown by the following figures:

	1903.	1904.	1905.
Number of employees	1,114	1,182	1,226
Number of employees examined	7,051	8,511	9,003
Number of apparently healthy employees	757	1,055	1,061
Number of sick employees	387	127	165
Number of deaths	401	132	(a)

aDoctor Neisser states that the records do not disclose the fact whether or not there were any deaths during 1905.

The use of respirators, thorough ventilation, the disengagement of turpentine vapors to promote rapid drying and strict cleanliness, such as ablution of the hands, change of clothing, and gargling with weak alkaline solutions before eating and drinking are still in order as preventive measures.

BEET-SUGAR INDUSTRY.

In the beet-sugar industry, especially when the diffusion method is employed, an explosive mixture containing probably carbureted hydrogen has proved a source of danger to the operatives, and the waste waters are believed to be also a menace to public health.

OCCUPATIONS INVOLVING EXPOSURE TO EXTREMES OF HEAT, SUDDEN CHANGES, AND ABNORMAL ATMOSPHERIC PRESSURE.

Exposure to extremes of heat and sudden changes is injurious and predisposes to a number of diseases. Stokers, cooks, bakers, blacksmiths, firemen, etc., are very apt to suffer from heat exhaustion and thermic fever (sunstroke). The duration of life is low, and rheumatism, eczema, catarrhal affections, pneumonia, and diseases of the heart are quite common. Sailors, farmers, motormen, conductors, teamsters, coachmen, and many others are often exposed to sudden changes in the weather, and suffer quite frequently from rheumatism, catarrhal affections, pneumonia, and Bright's disease.

The effects of both heat and cold are intensified by extreme humidity in the atmosphere, and special precautions are necessary upon hot and sultry days and in cold, raw weather. Occupations involving exposure to dampness, especially when performed indoors, are injurious,

because a cold, damp air abstracts an undue amount of animal heat from the body, lowers the power of resistance, and predisposes to catarrhal and rheumatic diseases. It is a well-known fact that damp houses favor the development of consumption.

CAISSON DISEASE.

The effects of compressed air on workmen in tunnels, caissons, deep mines, and diving bells were formerly attributed solely to increased atmospheric pressure, in consequence of which it was believed that the blood received not only an excess of oxygen, but by reason of the abnormal pressure was driven from the surface to the internal organs, causing congestion, especially of the central nervous system. It is now held that, while increased atmospheric pressure is capable of producing characteristic effects upon the circulation, such as pallor of the skin, ringing in the ears, bulging and possibly rupture of the ear drums, the most serious symptoms are produced when the pressure is too rapidly increased or removed by a faulty method of "locking in" and "locking out."

A commission of Belgian medical experts examined 166 caisson workers before and after their work, the shift lasting from 8 to 12 hours, and found 1, that the blood-making function, as shown by the hæmoglobin contents, was actually increased during their work; 2, that so long as the pressure does not increase beyond 3 atmospheres (45 pounds) the men feel perfectly well and perform their labor with more ease and even less fatigue than under normal atmospheric pressure; 3, that men of temperate habits, with a sound heart, lungs, and nervous system, suffer no injurious effects, and none others should be employed; 4, the real injury is done by a sudden removal of atmospheric pressure in a hasty "locking-out" process, for which the workmen are often to blame.

The general rule in "locking out"' should be to allow at least one minute for each 6 pounds of pressure within the chamber.

The symptoms of so-called caisson disease are rarely observed until the pressure equals 20 pounds, and usually do not appear for some minutes or hours after emerging. In addition to the symptoms already mentioned, there may be hemorrhage from the nose, mouth, and ears; headache, dizziness, rapid pulse, sweating, severe pain in the back, extremities, or region of the stomach, and vomiting. Partial deafness and symptoms of motor paralysis, more or less general, but most frequently confined to the lower extremities, are frequently observed. Cases with pronounced head and spinal symptoms usually prove fatal.

The milder cases, as a rule, recover sooner or later, although the muscular pains and paralytic symptoms may persist for weeks, or even longer.

OCCUPATIONS INVOLVING CONSTRAINED ATTITUDES.

The effects of a constrained position, combined with a sedentary life, are very injurious. This is especially seen in weavers, shoemakers, engravers, watchmakers, tailors, lithographers, etc., all of whom are obliged to assume a more or less constrained attitude, which interferes with a proper distribution of the blood supply and is liable to be followed by internal congestions. But perhaps the greatest harm results from deficient movement of the chest and consequent interference with normal respiration. As a matter of fact, many of these artisans suffer from phthisis, constipation, dyspepsia, and hemorrhoids, and all have a low average duration of life.

Among the apprentices of bakers, deformities such as "flat foot" and "knock-knee" and varicose veins of the lower extremity are frequently seen, as the result of being on their feet too long. Varicose veins and ulcers are quite common among motormen and conductors, while bakers, cabinetmakers, and others are also very liable to develop abnormal curvature of the spine.

OCCUPATIONS INVOLVING OVER EXERCISE OF PARTS OF THE BODY.

Among the diseases due to the excessive use of certain muscles may be mentioned the affection called "writer's cramp," which is a convulsive affection of the fingers. Similar fatigue neuroses, characterized by localized paralysis and twitching, are observed in copyists, typewriters, telegraph operators, pianists, violinists, engravers, seamstresses, cigar makers, etc.

Pulmonary emphysema is quite common among performers on wind instruments. Boiler makers' deafness and mill operatives' deafness may also be mentioned. The former is believed to be due to their constant exposure to an atmosphere in a state of violent vibration, while the latter affection is characterized by an inability to hear distinctly except during a noise. Public speakers and singers are apt to suffer from chronic affections of the throat and paralysis of the vocal chords, and watchmakers, engravers, and seamstresses, as well as all others who use their eyes upon minute objects, are more liable to suffer from nearsightedness and other visual defects.

Tobacco testers are apt to suffer from nervous symptoms and serious visual defects, and tea tasters soon become the victims of muscular tremblings and other nervous symptoms, the result of a chronic "theine intoxication."

OCCUPATIONS INVOLVING EXPOSURE TO MACHINERY, ETC.

Life insurance and accident policy statistics plainly indicate the danger of occupations which involve contact with machinery. This may be the result of individual carelessness or the negligence of others. Not infrequently accidents are the result of boiler explosions, circular saws, belting, and flying fragments, and are due to a lack of proper safety devices. As might be expected, many of the accidents befall children and inexperienced persons and take place at night or in badly lighted establishments. Roth calls attention to the accident statistics of the German Empire for 1897,[1] which clearly indicate that accidents increase with mental and muscular fatigue. Upon the assumption that there is one accident for every three working hours during the year, the average number of industrial accidents in the

Forenoon between:

6 and 9 o'clock was.....1.10
9 and 12 o'clock was.....2.26

Afternoon between:

12 and 3 o'clock was.....1.02
3 and 6 o'clock was.....2.11

Professor Imbert at the International Congress for Hygiene and Demography at Brussels, 1903, from an abundance of statistical material arrived at a similar conclusion. According to Rubner[2] of 100 accidents, 41 befell children under 15 years of age, 36.4 befell persons between 15 and 25 years of age, 13.1 befell persons between 25 and 40 years of age, and 9.5 befell persons between 40 and 60 years of age. The upper extremities were involved in 87 per cent. of the cases, the lower extremities in 7.5 per cent. and the head and trunk in 5.5 per cent. During the year 1899 there were in English factories 301 fatal and 19,321 nonfatal accidents, all attributable to machinery moved by mechanical power.[3]

Swiss statistics show that among 1,000 workingmen accidents occur

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[1]Ermuedung durch Berufsarbeit, Internat. Kongress fuer Hygiene und Demographie, Berlin 1907, Bund ii, p. 618.

[2]Lehrbuch der Hygiene, 6th Edit. Leipzig & Wien, 1899-1900, p. 701.

[3]Dangerous Trades, Oliver, p. 203.

as follows;[1] Cotton spinners, 2.22; millers, 28.0; paper manufacturers, 31.1; carpenters, 35.2; locksmiths, 46.9; brewers, 66.7; masons, 80.5; blacksmiths, 93.1; metal workers, 102.1; molders, 132.2.

Many of the accidents to metal workers, masons, miners, weavers, etc., befall the eye, and Magnus attributes 8.5 per cent of all cases of blindness to accidents.

Of 48,262 accidents among British miners from 1884 to 1898, not less than 2,506, or 5.19 per cent, affected the eye.[2]

COAL MINING.

The mining of coal is, even under the best conditions, one of the most dangerous industries. A report of the United States Geological Survey[3] shows the number of men killed for each 1,000 employed in the United States and in the four leading European countries, the figures being averages for five years.

NUMBER OF MEN KILLED FOR EACH 1,000 MEN EMPLOYED—AVERAGES FOR FIVE YEARS.

Country.	Number
France (1901-1905)	0.91
Belgium (1902-1906)	1.00
Great Britain (1902-1906)	1.28
Prussia (1900-1904)	2.06
United States (1902-1906)	3.39

The following table from the same report shows the number of deaths from accident for every million tons of coal mined:

NUMBER OF MEN KILLED IN COAL MINES PER MILLION TONS OF COAL PRODUCED.

Year.	United States.	Great Britain.	Belgium.	France.
1902	6.79	.....	6.29	4.80
1903	5.62	a4.70	6.68	4.20
1904	6.24	4.41	5.66	4.55
1905	5.97	4.64	5.64	4.17
1906	5.57	4.31	4.96	.....

aAverage, 1894 to 1903.

The causes of the fatal and nonfatal accidents in the coal mines of the United States in 1906 were as follows:

[1]Bergey's Principles of Hygiene, 1904, p. 276.

[2]Oliver, p. 776.

[3]Coal-Mine Accidents; Their Causes and Prevention. A Preliminary Statistical Report. United States Geological Survey, 1907.

CAUSES OF COAL-MINE ACCIDENTS IN THE UNITED STATES, 1906.

Accidents due to—	Persons killed.	Persons injured.
Gas and dust explosions	228	307
Powder explosions	80	215
Falls of roof and coal	1,008	1,863
Other causes	732	2,192

An exhaustive analysis of mining accidents in the German Empire will be found in the Statistik der Knappschafts-Berufsgenossenschaft fur das Deutsche Reich, Berlin, 1897. The total number of persons insured for one year during the period covered (October 1, 1885, to December 31, 1894) by the work was 3,623,175; the total number of accidents of all kinds notified was 278,371, distributed as follows:

TOTAL NUMBER OF ACCIDENTS OF ALL KINDS NOTIFIED.

Class of accidents.	Number.	Per 1,000 persons employed.
Fatal accidents	7,721	2.13
Accidents causing total permanent disability	1,427	.39
Accidents causing partial permanent disability	14,367	3.97
Accidents causing temporary disability	8,164	2.25
		8.74
Minor accidents	246,692	68.09
Total	278,371	76.83

The causes of the fatal and serious accidents as calculated per 1,000 employees are given as follows:

Falls of rock, coal, falling bodies, etc	3.44
Transport, haulage, winding, loading, etc	2.26
Falls from ladders, steps, or other heights	.89
Explosions	.78
Machinery in motion, motors, etc	.51
Molten metal, hot and corrosive fluids, poisonous gases	.12
Miscellaneous	.74
Total	8.74

Mr. Henry Louis, in commenting upon these statistics in Oliver's "Dangerous Trades," page 516, says, "41.6 per cent, or two-fifths, of all the accidents could have been avoided by proper care and intelligent thought on the part of all concerned, and, in the second place, fully one-third of the accidents can be ascribed to the faults of the victims themselves."

According to Revue Scientifique[1] during the past 50 years there

[1] 1875, II, p. 765.

were no less than 503 mine explosions in Europe, with a loss of over 5,000 lives. The number of men killed in the coal mines of the United States is appalling, amounting to 22,840 during the 17 years ending with 1906. In 1906 the total killed was 2,061 and about 5,000 injured.

In the introduction to the Report of the United States Geological Survey, already cited, on "Coal Mine Accidents: Their Cause and Prevention"[1] Mr. Joseph A. Holmes says: "The figures given in this report indicate that during the year 1906 nearly 7,000 men were killed or injured in the coal mines of this country, and that the number of these accidents caused directly or indirectly by mine explosions has been steadily increasing. * * * The increase both in the number and in the seriousness of mine explosions in the United States during the past years may be expected to continue unless, through investigations made in the United States, such as have proved effective in other coal-producing countries, information can be obtained and published concerning the explosives used, the conditions under which they may be used safely in the presence of coal dust or gas, and the general conditions which make for health and safety in coal-mining operations."

According to English data, cited by Frederick L. Hoffman (Quarterly Publications of the American Statistical Association, December, 1902, page 178), "for the period 1890-1892, at ages 45-54, the general death rate of all miners was 19.6 per 1,000, and of quarrymen 25.3 per 1,000. For coal miners alone the death rate at this age period was 19.4; for copper miners, 24.3; for tin miners, 32.2, and for lead miners, 23.9 per 1,000—indications of quite considerable differences in the mortality and specific disease liability of men engaged in the mining of coal and the different metals."

While tuberculosis is comparatively rare among coal miners, anthracosis (a lung disease produced by coal dust—"black lung"), miner's asthma, which is really a chronic bronchitis with emphysema, and simple chronic bronchitis are common affections. These diseases are largely influenced by defective ventilation, for Greenhow has shown that in the operatives of well-ventilated mines there is no excess of pulmonary diseases.[2]

Apart from large quantities of dust, the air of mines contains putrefactive gases from decomposing excrementitious matter, products of combustion, especially carbonic-acid gas, which is also one of the constituents of the "choke damp." In addition to all this, the "fire damp"

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[1]Page 4.

[2]Greenhow, third and fourth report of the medical officer of the Privy Council, 1860-1861.

(an explosive mixture of carbureted hydrogen with atmospheric air in the proportion of 6-10 volumes per cent) and the excessive temperature, real hard work, constrained attitude, and careless use of explosives add very greatly to the danger of miners.

Much can be done to prevent accidents by the introduction of safe hoisting cages, proper engineering, the use of suitable explosives, and adequate inspection laws, while Davy's safety lamps, incandescent electric lights, and copious ventilation will serve to prevent explosions of fire damp and aid in the purification of the air.

RAILWAY SERVICE.

Employees of the railway service, owing to a life full of hardships, exposures, and responsibilities, together with irregular habits, suffer not only from accidents, but also experience more or less sickness, especially from rheumatic affections, diseases of the digestive and respiratory organs, and injuries and disturbances of the nervous system. Forty-eight per cent of the German railway employees in 1885 were taken sick, as follows: Rheumatism, 8.18 per cent; digestive diseases, 11.12 per cent; respiratory diseases, 8.53 per cent; nervous diseases, 2.73 per cent. The train hands suffered most, and the office employees, of course, the least. The percentage of the different classes of sick employees was as follows:

PER CENT OF GERMAN RAILWAY EMPLOYEES TAKEN SICK, 1885 AND 1886, BY OCCUPATIONS.

Occupation.	1885.	1886.
Train arrangers	83	89
Train hands, engineers, conductors, brakemen, etc.	65	66
Gate keepers, etc.	54	56
Switch tenders	50	53
Track watchmen	40	42
Station employees	33	36
Office employees	23	26

Hedinger[1] has called attention to the fact that only 8 per cent of the German locomotive engineers have normal hearing, while 67 per cent of the engineers and 30 per cent of the firemen have very defective hearing; 14.5 per cent of the track-walkers also had defective hearing. The percentage in all increased with the length of the service. The most common affections were catarrh of the internal and middle ear, which were probably due to abrupt changes in temperature.

[1]Zeitchft, des Vereins d. Eisenbahnverwaltungen, 27, p. 25.

RAILWAY ACCIDENTS.

The reports[1] of the Interstate Commerce Commission indicate a constant increase in the number of injuries from railway accidents. The number of employees killed by accidents arising from the movement of trains, locomotives, or cars, as distinct from those of other causes, in 1906, was 3,709, of whom 2,310 were trainmen, and 42,962 injured, of whom 34,989 were trainmen. The number of fatalities to trainmen in this class of accidents is nearly equally distributed among collisions, falling from trains, locomotives, or cars, and being struck by trains, locomotives, or cars. When all classes of employees are taken into account the last-named cause is responsible for the greatest number of fatalities.

"Of the fatalities to passengers, collisions account for more than any other single cause, although the number due to jumping on or off trains, locomotives, or cars is nearly as great. In the matter of injuries, however, collisions are far ahead, being responsible for more than 35 per cent of the total injuries to passengers. Taking both passengers and employees into account, it is seen that collisions are responsible for a much higher number of deaths and injuries than any other one class of accidents."[2]

RAILWAY ACCIDENTS FOR THE YEARS 1888 TO 1906.

[Fom the Nineteenth Annual Report of the Interstate Commerce Commission on the Statistics of Railways in the United States, page 109.]

Year ending June 30—	Employees.		Passengers.		Other persons.		Total.	
	Killed.	Injured	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
1888	2,070	20,148	315	2,138	2,897	3,602	5,282	25,888
1889	1,972	20,028	310	2,146	3,541	4,135	5,823	26,309
1890	2,451	22,396	286	2,425	3,598	4,206	6,335	29,027
1891	2,660	26,140	293	2,972	4,076	4,769	7,029	33,881
1892	2,554	28,267	376	3,227	4,217	5,158	7,147	36,652
1893	2,727	31,729	299	3,229	4,320	5,435	7,346	40,393
1894	1,823	23,422	324	3,034	4,300	5,433	6,447	31,889
1895	1,811	25,696	170	2,375	4,155	5,677	6,136	33,748
1896	1,861	29,696	181	2,873	4,406	5,845	6,448	38,687
1897	1,693	27,667	222	2,795	4,522	6,269	6,437	36,731
1898	1,958	31,761	221	2,945	4,680	6,176	6,859	40,882
1899	2,210	34,923	239	3,442	4,674	6,255	7,123	44,620
1900	2,550	39,643	249	4,128	5,066	6,549	7,865	50,320
1901	2,675	41,142	282	4,988	5,498	7,209	8,455	53,339
1902	2,969	50,524	345	6,683	5,274	7,455	8,588	64,662
1903	3,606	60,481	355	8,231	5,879	7,841	9,840	76,553
1904	3,632	67,067	441	9,111	5,973	7,977	10,046	84,155
1905	3,361	66,833	537	10,457	5,805	8,718	9,703	86,008
1906	3,929	76,701	359	10,764	6,330	10,241	10,618	97,706

[1]Text of the 19th Annual Report on the Statistics of Railroads in the United States for the year ending June 30, 1906.

[2]Nineteenth Annual Report of the Interstate Commerce Commission on the Statistics of Railways in the United States, p. 112.

In 1899 the English Government appointed a commission composed of members of the House of Lords and Commons, representatives of the railway companies, railway employees, experts, and Government officials, with a view of determining whether the accidents to railway employees were so numerous as to constitute it a dangerous trade. The following table indicates that the employment of shunters (switchmen) is far more dangerous than any other occupation save seamen, and that the average work on railways is almost as dangerous as mining, and also illustrates the relative frequency of accidents in other occupations.[1]

NUMBER OF EMPLOYEES KILLED AND INJURED FROM ALL CAUSES PER 1,000 EMPLOYED IN VARIOUS OCCUPATIONS.

Industry.	Number killed.	Number injured.
Railway servants in general, excluding contractors' men, clerks, and mechanics	1.24	31.0
Goods guards and brakemen	2.92	61.0
Permanent-way men or platelayers	1.9	16.0
Shunters	5.08	78.0
Men porters (railway)	1.15	63.0
Seamen (merchant service)	5.2	Unknown.
Coal miners (underground)	1.37	Unknown.
Coal miners (surface)	0.92	Unknown.
Metalliferous mines (underground)	1.34	Unknown.
Metalliferous mines (surface)	0.43	Unknown.
Factories, textile (males)	0.1	6.2
Factories, textile (females)	.....	2.7
Factories, nontextile (males)	0.2	13.8
Factories, nontextile (females)	.....	2.0
Factories, extraction of metals (males)	1.1	16.4
Factories, shipbuilding (males)	0.5	39.3
Factories, dock laborers	1.4	57.0

ACCIDENTS AND INJURIES.

The total number of deaths reported during the census year of 1900 was 57,513, of which 43,414 were males and 14,099 were females, and the proportion of deaths from these causes in 1,000 deaths from all known causes was 57.6. In 1890 the corresponding proportion was 53.7. In the registration area the rate was 96 per 100,000 of population. In 1890 the death rate was 91.9. The rate in the cities was somewhat higher than in rural districts, and the rate for males was about three times as high (125.4) as it was among females (42.2). This is simply due to the more sheltered position of females and because males alone are generally engaged in the more dangerous operations.

[1] Dangerous Trades, Oliver, pp. 199, 200.

The following table shows for the registration area and its subdivisions the—

DEATH RATES FROM ACCIDENTS AND INJURIES DURING THE CENSUS YEAR IN EACH OF THREE AGE GROUPS PER 100,000 OF POPULATION.

Registration area.	Under 15.	15 to 44.	45 and over.
Total	67.0	89.8	150.5
Males	85.4	148.7	223.8
Females	48.6	31.1	78.0
Cities	70.2	94.3	163.8
Males	89.5	156.6	250.7
Females	50.9	33.3	80.1
States	63.7	73.4	131.2
Males	80.6	122.3	187.8
Females	46.7	24.9	75.8
Cities	68.2	73.1	139.7
Males	86.1	122.4	206.7
Females	50.3	25.9	77.9
Rural	57.2	73.9	122.6
Males	72.7	122.1	169.5
Females	41.3	23.1	73.5

From this table we learn that the highest death rates from accidents occurred in persons 45 years and over, and the lowest in children under the age of 15, which indicates that employment in factories, mines, and workshops influences to a great extent the number of accidents and injuries. The rates for females are the lowest in all three age groups, for reasons already assigned. Woman occupies a more favorable position even in childhood, on account of the more reckless disposition of boys, whose rates are probably increased by deaths from drowning, falls, burns, gunshot wounds, railroad accidents, etc.

An attempt to determine the number of persons injured to 1,000 employed in the factories was made in the State of New York during 1899. The data are based upon three months' observations in a selected list of factories, and are not regarded by the commissioner of labor and chief factory inspector of the State as absolutely accurate.

NUMBER OF PERSONS INJURED TO 1,000 EMPLOYED.

Industry.	Number.
Clothing, millinery, laundering, etc	1.35
Leather, rubber, pearl, etc	3.21
Textiles	8.91
Printing and allied trades	9.19
Food, tobacco, and liquors	13.51
Stone and clay products	15.18
Wood	18.42
Building industry	26.20
Metals, machinery, and apparatus	26.57
Public utilities	37.28
Pulp, paper, and cardboard	41.46
Chemicals, oils, and explosives	44.06

OCCUPATIONS INVOLVING THE INHALATION OF ORGANIC GASES AND VAPORS.

Whether the effluvia from sewers, stables, stock yards, slaughtering and packing houses; glue, candle, and soap factories; hide depots, tanneries, fertilizer-making, etc., are injurious to health remains an open question. Many authors insist that the olfactory organs are alone offended, and point to the mortality statistics, which indicate that the average age of such employees is quite high. Others hold that weaklings rarely engage in such occupations, and that the effluvia, consisting, as they do, of ammonia and sulphureted gases, are fully as injurious as the inhalation of sewer air, which, judging from experiments in animals, would appear to increase the susceptibility to infectious diseases by diminishing the power of resistance. Stift maintains that hydrogen and ammonium sulphides, chiefly derived from decomposition of animal matter and usually present in privy vaults, cesspools, and sewers, are blood poisons when present to the extent of about 1/4,000 volumes per hundred. The same author believes that the inhalation of sulphureted hydrogen affects directly the terminal filaments of the pneumogastric nerve, and through these sets up an irritation of the respiratory and cardiac centers—in fact, of the entire medulla oblongata—and if continued sufficiently long induces paralysis of this function.

In sewer air the danger is intensified by the excess of carbonic-acid gas and deficiency of oxygen, and special precaution should be taken to exhaust the foul air before sewer employees or scavengers are allowed to descend.

The general effects of the foul odors upon those unaccustomed to work in the so-called "offensive trades" are nausea, vomiting, headache, loss of appetite, diarrhœa, a general depression, and weakness. It is true the workmen become gradually accustomed to these emanations without any apparent injury, but even this does not justify the assumption that they are of no consequence.

Every community provides for the collection and disposal of dead animals, which is usually done by contract, and the animals are taken to some point beyond the town limits, flayed, and worked up, so as to utilize the skin, hair, bones, fats, horns, etc. There is, however, a certain element of danger from the transmission of infectious diseases like anthrax, glanders, and tuberculosis, and hence all such work should be done under strict sanitary control.

EMPLOYMENT OF WOMEN AND CHILDREN.

In the face of the many adverse circumstances under which labor is often performed, it is but natural that the immature employees and females should suffer most. The former not infrequently inherit a weak constitution, or acquire it by insanitary homes and deficient food, and quite a number are obliged to enter upon active work long before their bodies are sufficiently developed. Quite apart from the fact that child labor is a menace to education, morals, and good citizenship, the effects of premature and involuntary labor upon the health and physical welfare of the child are extremely detrimental. Quetelet, in his Physique Sociale, as early as 1869 demonstrated that the muscles of the average child attain only at the age of 13 or 14 a certain amount of strength and capacity for work. Up to this time the muscular fibers contain a larger percentage of water, and in consequence are very tender and immature. Demetjeff, cited by Rubner[1] determined the lifting power of the arms and trunk at different ages of the working classes to be as follows:

LIFTING POWER OF THE ARMS AND TRUNK OF THE WORKING CLASSES AT DIFFERENT AGES.

Age.	Kilograms.	Age.	Kilograms.
14 years	82	30 to 35 years	150
16 years	101	35 to 40 years	160
18 years	128	40 to 50 years	148
20 to 29 years	140	50 to 60 years	134

These figures clearly indicate that the average boy at the age of 14 possesses about one-half the muscular strength of an average adult between 35 and 40 years of age.

As a consequence of imperfect muscular development, it is not surprising that a large percentage of young persons engaged in workshops, factories, or even at the writing desk or merchant's counter, develop lateral curvature of the spine and other muscular deformities, not to mention general weakness and predisposition to rickets, tuberculosis, and other pulmonary diseases. All of the bad effects are naturally intensified by insanitary environment, especially when the occupations are attended by the inhalation of dust, injurious gases, and impure air. The report of the commission on child labor, 1833-1834, appointed by the English Parliament, contains many interesting facts; but in spite of legislative efforts Dr. Charles W. Roberts[2] has occasion to refer

[1]Lehrbuch d. Hygiene, Leipzig und Wien, 1906, p. 709.
[2]London Lancet, 1875, p. 274.

to the prevalence of "flat feet," "knock-knee," and the premature aged condition of youthful employees.

Doctor Roberts says: "In general conformation of body the factory children do not compare favorably with the agricultural. In the manufacturing towns the children are short of stature, have thick limbs and large feet and hands, and are muscular and in tolerable condition as to fat. They produce the impression on the mind of having bodies too old for their heads (and ages). 'Flat foot," with a general disposition to 'knock-knee,' is very common among the factory children, while both are rare among the agricultural, among whom there is a disposition to the opposite state, of bowleg."

Doctor Roberts[1] examined 19,840 English boys and men. Of these, 5,915 belonged to the nonlaboring classes—school boys, naval and military cadets, medical and university students; 13,931 belonged to the artisan class. The difference in height, weight, and chest measurement from 13 to 16 years of age was as follows:

DIFFERENCE IN HEIGHT, WEIGHT, AND CHEST MEASUREMENT OF 19,846 ENGLISH BOYS AND MEN AT SPECIFIED AGES.

Class.	At 13 years.	At 14 years.	At 15 years.	At 16 years.
Average height in inches:				
Nonlaboring	58.79	61.11	63.47	66.40
Artisan	55.93	57.76	60.58	62.93
Difference	2.66	3.35	2.89	3.47
Average weight in pounds:				
Nonlaboring	88.60	99.21	110.42	128.34
Artisan	78.27	84.61	96.79	108.70
Difference	10.33	14.60	13.63	19.64
Average chest girth in inches:				
Nonlaboring	28.41	26.28	30.72	33.08
Artisan	25.24	26.28	27.51	28.97
Difference	3.17	3.37	3.21	4.11

Congress, on February 19th, 1907, authorized a federal investigation of the subject of child labor under the direction of the United States Bureau of Labor and the results of such investigation may more clearly define the need for federal legislation or indicate other means adapted to regulate the evil.

During the Census year of 1900 there were 1,752,187 children under 16 years of age employed in gainful occupations; of these over 80,000 were employed in the textile industry; 7,116 in the glass industry; about 25,000 in mines and quarries; 12,000 in the manufacture of tobacco and cigars; over 10,000 in wood industries; over 7,000, mostly girls, were employed in laundries; 2,000 in bakeries; 138,000

[1]Cited by John Spargo, Bitter Cry of the Children, 1906, p. 96.

as waiters and servants; 42,000 boys as messengers and 20,000 boys and girls in stores. Mr. John Spargo in "The Bitter Cry of the Children," on page 211, gives the result of his investigation covering 213 cases of child labor with a view of determining the cause. He found that 52 children were obliged to work because their father earned less than $10.00 a week; in 13 instances the father was out of employment; in 19 the father was sick; in 12 the father had died; in 4 the father had deserted the family; in 4 other instances he was intemperate, and in 1 case the father was in prison. He concludes that in these 105 instances the primary cause was poverty.

Of 108 other children, the causes are given as follows: School difficulties, 30; "because friends went to work," 18; "to get better clothes," 11; "to enable parents to save," 17; sickness while in school 5; father's laziness, 2; not determined, 25.

Child labor differs in degree as well as in kind. The ordinary messenger or newsboy may not sacrifice his health, but his morals and his education must inevitably suffer. And so we see different gradations until some of the most injurious forms of child labor are encountered.

Dr. Annie S. Daniel, in speaking of her personal observations in New York, tells[1] us that a child 3 years old can straighten out the leaves of tobacco and can stick together the materials which form the stems of artificial flowers. At 4 he can put the cover on paper boxes. Between 4 and 6 he can sew on buttons and pull basting threads. A girl from 8 to 12 can finish trousers as well as her mother. After she is 12, if of good size, she can earn more money in a factory, because she will be accepted if her size justifies the evasion of the law. The boys practically perform the same labor as the girls, except that they leave home earlier and engage in street work as peddlers, newsboys, or bootblacks. Doctor Daniel has actually seen two children under 3 years of age working in the tenements of New York—one, a boy 2½ years of age, assisting the mother, and four other children under the age of 12, in making artificial flowers. "These children earn from 50 cents to $1.50 a week, obviously at the expense of health and education—rights which neither the parents nor the community nor the State have a right to withhold."

A feeling seems to exist in Washington that there is no special need for the enactment of a law to prevent or regulate child labor, but the same class of people told us years ago, that we had so slums, and hence there was no occasion for the betterment of the housing conditions, when, as a matter of fact, investigations have shown conclusively that in many respects we are as badly, if not worse, off than the cities of

[1]Charities, April 1, 1905.

New York and Chicago. Those who are familiar with the subject know, that there is a local situation which demands legislation. But whether the number is large or small it matters little, and it is clearly the duty of every community to resort to preventive measures against this hydra-headed evil.

It has been asked, "What is the use of enacting child labor laws when such atrocious instances are possible in the city of New York, where child labor law exists?" and it must be granted, that just such evils will be witnessed in New York or any other American city so long as public opinion and the conscience of the American people is not sufficiently aroused to demand the enforcement of the law.

It has been estimated, that there are in this city between fifteen hundred and two thousand children under the age of fifteen engaged in wage-earning occupations. And we feel that the enactment of a suitable law would guard these children and afford them a better opportunity of becoming useful citizens, and the consumers would at least have the satisfaction of knowing that they are not stained with the sweat and blood of helpless children.

How many more of the six thousand children between the ages of eight and twelve, who are not now at school, are engaged in wage-earning occupations we do not know. But whether they are at work because of the necessities of their parents or because of their own disinclination to study, the law should intervene and establish an effective remedy.

It has been urged, and no doubt in many instances quite correctly, that child labor is encouraged by the greed of the employers, but the writer is in a position to know that the business men of this city would hail with delight the enactment of a child labor law. As it is now, it is not always an easy matter to refuse to lend a helping hand in apparently deserving and pathetic cases.

It is indeed deplorable that so little has been accomplished in the way of educating the public to a sound and full appreciation of the evil consequences of child labor, and it is especially humiliating to know that the District of Columbia, the seat of the National Government, is the only community with the exception of Georgia, Idaho, Nevada and the Indian Territory, which is at present without legislation of some kind on the subject of child labor.

Women, on account of their imperfectly developed muscular system and more delicate physique, are unfitted for hard work; nor should they be obliged to work steadily in a sedentary position especially at the sewing machine or other occupations involving the use of the lower extremities. Special protection should be extended to them during the

child-bearing period. It is a matter of constant observation that women who have to deny themselves proper rest and care during the last six weeks after confinement are very liable to suffer from hemorrhages and chronic uterine diseases, while miscarriages and premature births are not infrequent results of overwork. Recent statistics collected by Doctor Neisser (1907) indicate that such accidents are quite frequent among farmers' wives and women employed in the jewelry industry, where the motor power is supplied by the feet.

INFANT MORTALITY IN RELATION TO THE OCCUPATION OF WOMEN.

Attention has been directed on another page to the high rate of infant mortality in certain mill towns of Massachusetts. This subject has received careful attention, especially in England. The investigations made by Sir John Simon and his colleagues into the sanitary condition of England between 1859 and 1865 showed "that in proportion as adult women were taking part in factory labor or in agriculture the mortality of their infants rapidly increased." Among other causes, Simon attributes the excessive mortality of infants under 1 year, which in some registration districts was from two and a quarter to nearly three times as high as in standard districts, "to occupational differences among inhabitants, there being certain large towns where women are greatly engaged in branches of industry away from home, where, consequently these houses are ill kept, where the children are little looked after, and where infants who should be at the breast are improperly fed or starved, or have their cries of hunger and distress quieted by those various fatal opiates which are in such request at the centers of our manufacturing industry."[1]

Fifty years have elapsed since Simon declared "infants perish under the neglect and mismanagement which their mothers' occupation implies." The subject has since been studied by the medical officers of the home office, the local government board, and 1,800 local health boards in England. Doctor Newman has carefully surveyed the facts concerning the number of females employed in gainful occupations, the percentage of married women, the infant mortality rate in towns having a low percentage of women so employed, as compared with textile towns, where the percentage of female employees is high. He has given careful consideration to the character and condition of the work, the length of working hours, employment before and after childbirth, and the sanitation of workshops. He dwells very justly upon the evil

[1]Papers Relating to the Sanitary State of the People of England, 1858.

effects of the added strains of factory life, such as piece work, hard physical labor, injurious trade processes, fatigue, etc.

Doctor Newman tells how in some trades, like brickmaking, tinplate works, iron hollow ware, certain hardware trades, jam and sauce factories, and mat works, women are not infreqently employed in carrying or lifting weights altogether beyond their physical endurance. He emphasizes the various dangers to which the female employees are exposed, and summarizes the direct injuries as follows: (*a*) Accidents from machinery, materials, and other external agents; (*b*) injury or poisoning from toxic substances, or injury from excessive dust, fumes, vapor, or extremes of temperature (he refers also to anthrax infections in horsehair factories, tetanus in jute works, lung diseases in dusty trades, and abortion in lead works): (*c*) injury through fatigue and strain, long hours, insufficient periods of rest for food; (*d*) injury derived from defective sanitary conditions, such as bad ventilation, dampness, insufficiency or unsuitability of sanitary conveniences; and (e) too short a period of rest at the time of childbirth.[1]

He declares that the official reports of factory inspectors and of medical officers of health reveal ample evidences of these injuries, and adds: "Where the conditions resulting in these evils, coupled with the absence of the mother from home, are present, the infant mortality is high; where they are not present it is usually low." He describes the general effects of the factory system at Dundee, where 24,879 women and girls are employed in the jute and hemp factories, and another 3,000 women are employed in other textile works. One-quarter of the women, or about 6,000, are married, and about 16 per cent of all the girls in Dundee between the ages of 10 and 14 are employed in these trades.

The infant mortality rate for Dundee "is exceptionally high, and for the decennial 1893-1902 was 176 per 1,000 births." In 1904 there were 788 infant deaths, 129 of which occurred within the first week, and all but four of these were medically certified as due to "prematurity and immaturity." Nearly one-half of the total number occurred in the first three months of life. Inquiry was made into the social conditions of the home life of 364 of these infant deaths. "The occupations, or former occupations, of the mothers were as follows: 84 weavers, warpers, or winders; 105 spinners, piecers, or shifters; 88 preparers; 12 sack machinists or sack sewers; 27 miscellaneous; 20 unoccupied, and 25 concerning which there was no return obtainable. Of the cases inquired into 13.2 per cent of these mothers worked at the

[1]Infant Mortality, George Newman, M. D., New York, 1907.

factory to within a week of childbirth. Fifteen women worked to within a few hours of childbirth."

Doctor Newman's final conclusion on the subject of infant mortality in relation to the occupation of women is as follows:[1]

"No doubt the factory plays a part, but the home plays a vastly greater part, in the causation of infant mortality in the towns where women are employed at the mills. There are two influences at work—first, the direct injury to the physique and character of the individual caused by much of the factory employment of women, and, secondly, the indirect and reflex injury to the home and social life of the worker. We can not afford to forget either of these points in attempting to estimate the operations of the factory in infant mortality. It is because they have not been sufficiently correlated together that fallacy has arisen in the past. But even yet we have not finished. 'Infantile mortality in Lancashire,' writes an experienced medical officer of health for a town in that county with an infant mortality in 1904 of 222, 'is, I am sorry to say, as much a financial as a hygienic question.' Why do married women work in the mills? is the question this medical officer has reached. His answer is that 'a weaver's wages will not allow of the wife's remaining at home, considering the high rents and rates, and so both go—which is the rule—and a hand-to-mouth existence results even for themselves, let alone the little ones, who are left in the intervals to the mercies of the nurse, who, as a rule, takes in the babies to eke out her own husband's wages. Much good may be done by hygienic tuition, but I am certain that the root of the whole matter with us is, as I have said, comparatively low wages and high rents and rates."

In the discussion of infant mortality it would be unfair not to emphasize other facts, such as impure and dirty milk and one-room tenements. Of 54,047 infantile deaths which were investigated both in the Old and the New World as to the character of feeding, it was found that 86 per cent had been artificially fed. Neumann,[2] in investigating 2,711 infantile deaths in Berlin, found that 1,792 occurred in one-room apartments, 754 in two-room apartments, 122 in three-room apartments, and 43 in apartments of four rooms and over.

It is hoped that Dr. Newman's study of the subject will result everywhere in the amelioration of existing conditions, for, as pointed out by the author and Sir John Simon, a high death rate of infants suggests racial degeneracy and is at least "an indication of the existence of evil conditions in the homes of the people—which are, after all, the vitals of the nation."

Dr. Daniels, in speaking of the female labor question in New York,

[1]Infant mortality, Newman, p. 137.
[2]Deutsche Med. Wochenschft, Leipzig, 1904, p. 1723.

says: "That in no case in over 515 families examined by her was any woman working other than from dire necessity. The average weekly income from the man's work was $3.81. The average rent was $9.00 per month. The average family to be supported was 4½ persons. As it requires more than two weeks' wages to pay one month's rent it is evident that the women and children must work or the family go hungry." (Charities, April 1st, 1905.)

Those interested in female labor as carried on in the "sweat shops" of New York at the rate of $3.00 to $4.00 a week, should not fail to read "The Long Day; The True Story of a New York Working Girl as Told by Herself."

SPECIAL MEASURES FOR THE PREVENTION OF TUBERCULOSIS AMONG WAGE-EARNERS.

There is abundant statistical evidence to show that industrial workers pay a very heavy tribute to the so-called "white plague;" nor is it cause of wonder when the many unfavorable factors to which they are subjected are considered, such as crowded and insanitary workshops, deficient light, overwork, long hours in a bad air, dampness, exposure to extremes of heat and cold, sudden changes in temperature, and the inhalation of irritating dust, vapors, etc. All of these factors are calculated to lower the power of resistance and favor the spread of disease, especially when some of the workmen themselves are already afflicted and are careless in the disposition of their expectoration.

On the other hand, it would be unfair not to consider the influence of home environment, such as unclean and crowded or otherwise insanitary dwellings, insufficient or improper food, and last, but not least, the bad effects of the abuse of alcohol. It has been shown that alcohol not only affects the digestive and nervous functions, in consequence of which the general nutrition of the body is markedly reduced, but the habit of visiting and remaining in saloons for hours, sometimes till midnight, deprives the individual of proper rest and exposes him to the poisonous fumes of tobacco, coal and carbonic-acid gases, and other injurious agents. The preventive measures are partly the duty of the State, which should regulate the air space and ventilation of the workshops and dwellings and improve the working conditions by forced ventilation and "wet processes" in order to diminish dust production, and exposure to irritating gases. On the other hand, it is clearly the duty of the workmen themselves and the community at large to improve social and housing conditions. In view of the undue prevalence of consumption among file cutters, metal grinders, stonecutters, and cotton, flax, and tobacco operatives, persons predisposed

to this disease should be cautioned against engaging in such occupations. Simple printed instructions should be given as to the part expectoration plays in the spread of consumption. Cuspidors in sufficient number and properly disinfected should be provided, preferably one for each workman, and promiscuous expectoration should be forbidden.

MEASURES FOR THE PROTECTION OF WAGE-EARNERS.

From what has been said it is evident that the laboring classes need special protection against the many dangers referred to, and this should emanate from the State, the employers, the community and the employees themselves.

One of the important predisposing causes to disease is overwork or fatigue, because the accumulation of waste products in the blood, from muscular wear and tear, together with the expended nervous energy, combine to render the system more susceptible to disease. Excessive work is inimical to health, and long hours and hard work are calculated to diminish the general power of resistance, and thus bring about physical deterioration. Hence the necessity of laws regulating the hours of labor and the enforcement of a day of rest as contemplated by the Sunday laws.

Professor Roth's conclusions on this subject are as follows:[1] 1. In order to prevent a state of chronic fatigue it is essential that the amount of work be regulated by the capacity of the individual. 2. The more intensive the work and the shorter the intervals of rest for the elimination of waste products, the earlier we may expect manifestations of fatigue and the working hours must be regulated accordingly. 3. Other industrial dangers like excessive heat, humidity, violent concussions, constrained attitude, overexercise of certain groups of muscle, exposure to vitiated air and toxic agents favor premature fatigue, and should be controlled by rational measures. 4. Insufficient and improper food, vicious habits, long walks to place of work, and abuse of alcoholic drinks lower the vital powers and produce premature fatigue. 5. Monotonous work or any employment involving responsibility and intense mental application are conducive to fatigue. All of these factors should be considered and controlled by suitable preventive measures, so as to avoid the chronic effects of fatigue, which are generally evinced by anæmia, digestive derangements, neurasthenia, respiratory and cardiac difficulties.

No child should be permitted to work in factories and wage-earning

[1] Ermuedung durch Berufsarbeit Intern. Kongress fuer Hygiene und Demogaphie, Berlin, 1907, Band, ii, p. 620.

occupations under the age of 14, and then only upon presentation of a medical certificate that it is free from physical defects. Such children should not be obliged to work longer than six hours, with a two-hour interval of rest after the first three hours, so that they may be able to enjoy their noon dinner. Under no circumstances should they be permitted to perform night work or engage in the so-called dangerous occupations. The same may be said of individuals between the age of 16 and 18 years, who, however, may be permitted to work eight hours a day, with proper intervals for meals and rest.

Women, even from a moral standpoint, should not be permitted to work in factories or shops after sundown. The laws of some countries prescribe one hour for nooning, if they have their own households, and their exclusion from factories six weeks before and after confinement, while in other countries hard labor for women is strictly forbidden.

SANITATION OF WORKSHOPS AND QUARTERS FOR EMPLOYEES.

The protection of wage-earners should extend to the work and workshops, and, in case the employees are housed by the employer, also to the living and sleeping quarters.

A sanitary workshop demands sufficient air space for each inmate, a suitable temperature, proper ventilation and illumination, general cleanliness, and suitable opportunities for personal cleanliness. The necessity for abundant ventilation is apparent when it is recalled that men at work eliminate more carbonic-acid gas than individuals at rest, and that in the majority of occupations the air is further vitiated by the presence of dust and gases.

The question of illumination is not only important for the prevention of defective vision and accidents, but when recourse is had to artificial illumination the additional vitiation of the air must be considered. Such matters, which, after all, are largely questions of public health, should not be left to the individual employer, but the principles of industrial hygiene which ought to be adopted should be embodied in suitable laws and enforced by competent inspectors. Among the most dangerous forms of workshops is one class which most State laws entirely ignore. For example, under the law of the State of New York relating to manufacturing in tenement houses, 33 distinct industries may be carried on in the living rooms of the workers, because they involve hand work or simple machinery. There are over 23,000 licensed "home factories" in the city of New York alone. Dr. Annie S. Daniels, who made a special investigation of manufacturing in tene-

ments, says[1] "that every garment worn by a woman is found being manufactured in tenement rooms; the same is true of clothing worn by infants and young children. In addition to wearing apparel for men, women, and children, including adornments of woman's dress, the flowers and feathers for her hats, the hats themselves, and neckwear of every description, she found the manufacture of paper boxes, cigars, pocketbooks, jewelry, clocks, watches, wigs, fur garments, paper bags, etc., and the articles frequently handled and stored in infected rooms." According to Doctor Daniels, among the 150 families tabulated by her, 66 continued at work during the entire course of the contagious disease for which she was attending the family, and the question naturally arises, How many germs of tuberculosis, measles, scarlet fever, diphtheria, and other infectious diseases may be sewed in the garments made in the tenement "sweat shops?" And last, but not least, the greatest danger falls upon the workers—it means the loss of health, physically and morally, the loss of home, because home life is impossible in a tenement workroom."

Apart from the occupations referred to, numerous bakeries, candy, ice-cream, and milk shops; butcher shops and sausage factories; bottling establishments; tailor, cobbler, and other repair shops are carried on in basements under the most unsanitary surroundings as regards workrooms and sleeping quarters.

CUBIC AIR SPACE AND AMOUNT OF FRESH AIR PER HOUR.

Reference has been made to the baneful effects of vitiated air, which are of course intensified when the occupation is attended with the production of dust and irritating fumes or gases. It is known that carbonic acid is not itself a toxic agent, but an excess of this gas in the air of rooms leads to a deficiency of oxygen, and also to defective elimination of carbonic acid from the system, which can not be excreted whenever the tension of carbonic acid in the air exceeds that of the carbonic acid in the blood. In order that the respiratory impurities may not exceed certain limits (6 volumes of carbonic acid per 10,000), it has been found that an average adult requires 3,000 cubic feet of fresh air per hour, and this amount should be supplied without discomfort to the occupants. Experience has shown that the air of a room can not be changed oftener than three times in one hour in winter without causing a disagreeable draft; hence every occupant should have a cubic air space of 1,000 feet. This is the ideal standard, and section 100 of the

[1]Charities, April 1, 1905.

factory laws of New York of 1901 (as amended by chapter 129, Acts of 1906), relating to certain manufactures in tenements, provides "that the whole number of persons therein shall not exceed one to each 1,000 cubic feet of air space." Such an ideal standard, however, is not always attainable in workshops, and it is believed that for practical purposes an air space of from 400 to 500 cubic feet per capita will suffice.

The States of New York, Indiana, Michigan, New Jersey, Ohio, Pennsylvania, and Wisconsin appear to be the only States which make a definite provision on this point, and they require an air space of 250 cubic feet for each employee between the hours of 6 a. m. and 6 p. m., and, unless by written consent of the factory inspector, not less than 400 cubic feet for each employee between the hours of 6 p. m. and 6 a. m., provided such room is lighted by electricity, etc. This is a step in the right direction, but it would be extremely desirable to place the minimum amount of cubic air space at 400 feet for day work and 500 feet for night work, unless electricity is used, in which case a uniform standard of 400 feet might be prescribed. At all events the question of sufficiency ought not to be left to the discretion of the factory inspector. Either the cubic air space should be specified or the carbonic acid limited to 12 volumes per 10,000.

VENTILATION.

Ventilation, which means the removal and dispersion of bad air and the introduction of fresh air, is accomplished either by natural or artificial means. Natural ventilation is usually sufficient when each occupant has 1,000 feet of cubic air space, the walls of the building are porous or contain numerous crevices near the doors and windows, the difference between the indoor and outdoor temperature is considerable, and the winds strike the walls directly or pass with great velocity over chimney flues or other openings. But as the direction and force of the winds and the other factors referred to can not be controlled, other means should be provided for ventilation. For this purpose, open windows, doors, and revolving fans answer very well in summer. The objection to this method are the cold drafts in winter. In rooms heated with direct radiation the fresh air should therefore be admitted above the heads of the occupants, either by fresh-air register inlets in the walls or by the insertion of louvered or swinging windows, thus an upward direction being given to the air, so that it may impinge on the ceiling, mix with and be warmed by the heated air in this situation, falling gently into all parts of the room, and being gradually removed by means of the foul-air outlets, aided by exhaust fans. Another simple

plan is to bore slanting holes in the bottom rail of the window sash, or to employ a Pullman or Bury ventilator, or to insert a piece of board 4 inches wide across the window sill. The separation of the sashes thus caused will provide for indirect fresh-air inlets.

Artificial ventilation, which may be secured by providing 1, Suitable inlets and outlets; 2, by extraction by heat, or the creation of a decided difference betwen the inner and outer temperature; and, 3, by propulsion and aspiration. Space will not permit to enter into details except to say that, besides the contrivances already mentioned, any of the ordinary registers in which the air passes through the walls by means of a perforated iron plate and is then directed upward by a valved plate with side checks will prove of service. McKinnel's ventilator consists of two cylinders, one inside the other and of different lengths, the longer tube, projecting above and below, serves to conduct the impure air, while the outer cylinder, having a larger sectional area serves as an inlet. The outlet is protected on the top with a cowl, and both tubes can be regulated by valves. They are especially useful in the ventilation of one-story buildings or the upper story of any building. If gas is used as an illuminant, the burners may be placed immediately under the extracting tube. As the warm air escapes through the inner tube a corresponding volume is admitted through the interspace between the two cylinders.

The Ridge ventilators consist of openings through the ceiling and roof with louvered sides and ends, protected with a small roof, the opening of the air shaft in the ceiling usually being provided with suitable registers. The fresh air is admitted by the means already referred to, or by registers placed behind radiators. If the building is heated by stoves, the fresh air may be admitted by inlets running underneath the floor between the joists and discharging through a register near the stove.

Extraction of foul air by heat is usually accomplished by placing a separate flue next to the chimney flue; the latter, if in use for firing purposes, creates an upward current. If this is not sufficient it may be promoted by gas jets or a steam coil placed in the flue.

The propulsion and aspiration system is especially adapted for all large buildings and factories, and consists of mechanical devices by which the fresh air is forced into and distributed throughout the building by the use of fans or air propellers, the foul or objectionable air being removed by so-called exhaust fans. A number of States have made statutory provisions for the ventilation of workshops, and quite a number, including California, Connecticut, Illinois, Indiana, Iowa, Maryland, Massachusetts, Ohio, Oregon, Pennsylvania, Michigan, Min-

nesota, Mississippi, New Jersey, New York, South Dakota, Washington, and Wisconsin, require mechanical devices for the removal of injurious dust or gases. Of these States several lay down specific rules concerning the construction of workbenches and hoods. The latter empty into air shafts connected with exhaust fans, and thus extract all dust and fumes without material injury from drafts to the operatives. The provisions apply especially to operations in which emery wheels or belts or other buffing processes are employed. The laws of the State of Michigan, acts of 1899, furnish a good example of regulations of this character.

ACTS OF 1899.

ACT No. 202.—*Factories and workshops—Blowers for emery wheels, etc.*

SECTION 1. All persons, companies or corporations, operating any factory or workshop, where wheels or emery belts of any description are in general use, either leather, leather covered, felt, canvas paper, cotton or wheels or belts rolled or coated with emery or corundum, or cotton, wheels used as buffs, shall provide the same with fans or blowers, or similar apparatus, when ordered by the commissioner of labor, which shall be placed in such a position or manner as to protest [protect] the person or persons using the same from the particles of the dust produced and caused thereby, and to carry away the dust arising from, or thrown off by such wheels, or belts, while in operation, directly to the outside of the building or to some other receptacle placed so as to receive and confine such dust, and the same shall be placed in such factory or workshop within three months after this act shall take effect, in the manner and according to the directions and specifications as herein, in this act set forth: *Provided,* That grinding machines upon which water is used at the point of grinding contact shall be exempt from the conditions of this act: *And provided further,* That this act shall not apply to solid emery wheels used in sawmills or planing mills or other woodworking establishments.

SEC. 2. It shall be the duty of any person, company or corporation operating any such factory or workshop to provide or construct such appliances, apparatus, machinery or other things necessary to carry out the purpose of this act, as set forth in the preceding section, as follows: Each and every such wheel shall be fitted with a sheet or cast-iron hood or hopper of such form and so applied to such wheel or wheels that the dust or refuse therefrom will fall from such wheels or will be thrown in such hood or hopper by centrifugal force and be carried off by the current of air into a suction pipe attached to same hood or hopper.

SEC. 3. Each and every such wheel six inches or less in diameter shall be provided with a three-inch suction pipe; wheels six inches to twenty-four inches in diameter with four-inch suction pipe; wheels from twenty-four inches to thirty-six inches in diameter with a five-inch suction pipe; and all wheels larger in diameter than those stated above shall be provided each with a suction pipe, not less than six inches in diameter. The suction pipe from each wheel, so specified, must be full sized to the main trunk suction pipe, and the said main suction pipe to which smaller pipes are attached shall, in its diameter and capacity, be equal to the combined area of such smaller pipes attached to the same; and the discharge pipe from the exhaust fan, connected with such suction pipe or pipes, shall be as large or larger than the suction pipe.

SEC. 4. It shall be the duty of any person, company or corporation operating any such factory or workshop, to provide the necessary fans or blowers to be connected with such pipe or pipes, as above set forth, which shall be run at such a rate of speed as will produce a velocity of air in such suction or discharge pipes of at least nine thousand feet per minute or an equivalent suction or pressure of air equal to raising a column of water not less than five inches high in a U-shaped tube. All branch pipes must enter the main trunk pipe at an angle of forty-five degrees or less. The main suction, or trunk pipe, shall be below the polishing or buffing wheels and as close to the same as possible and to be either upon the floor or beneath the floor on which the machines are placed to which such wheels are attached. All bends, turns or elbows in such pipes must be made with easy smooth surfaces having a radius in the throat of not less than two diameters of the pipe on which they are connected.

SEC. 5. It shall be the duty of any factory inspector, sheriff, constable or prosecuting attorney of any county in this State, in which any such factory or workshop is situated, upon receiving notice in writing, signed by any person or persons, having knowledge of such facts, that such factory or workshop, is not provided with such appliances as herein provided for, to visit any such factory or workshop and inspect the same and for such purpose they are hereby authorized to enter any factory or workshop in this State during working hours, and upon ascertaining the facts that the proprietors or managers of such factory or workshop have failed to comply with the provisions of this act, to make complaint of the same in writing before a justice of the peace, or police magistrate having jurisdiction, who shall thereupon issue his warrant directed to the owner, manager or director in such factory or workshop, who shall be thereupon proceeded against for the violation of this act as hereinafter mentioned, and it is made the duty of the prosecuting attorney to prosecute all cases under this act.

TEMPERATURE.

It is a well-known fact that the welfare and capacity for work of individuals are to a great extent influenced by the surrounding temperature. Reference has been made to occupations involving exposure to extremes of heat and cold, dampness, and sudden changes. The human organism possesses the faculty of maintaining a uniform temperature; i. e., it so regulates and harmonizes the production and the loss of animal heat that the normal temperature of the blood, 98.2 Fahrenheit, is not materially affected, and in this the skin doubtless plays the most important role. Whenever cold acts upon the skin the irritation is primarily exerted upon the nerves, which transmit it to the central organs of the nervous system (the heat-regulating center), and from there it is reflected to the nerves of the cutaneous vessels and muscular fibers, which promptly contract, and in consequence of a diminished blood supply there is less loss of heat. If, on the other hand, heat instead of cold plays upon the skin, we have dilatation instead of contraction of the vessels, with an increased surface blood supply and corresponding loss of heat by radiation and conduction. At the same

time the perspiratory glands are stimulated to greater activity, more sweat is excreted and evaporated, and still more heat is dissipated. One of the bad effects of profuse perspiration is that the blood is deprived of some of its constituents. The blood is taken away too long from the internal organs; the proper distribution of the blood supply is interferred with, and in consequence the tone and nutrition of the stomach, lungs, heart, and other internal organs is lowered. We lose our appetite and suffer from indigestion; the red corpuscles are decreased; we experience languor and general enervation, and the system in consequence is rendered more susceptible to disease.

While the human organism endeavors to adapt itself to extremes of heat and cold, the faculty of the body to maintain the equilibrium is by no means unlimited, and the heat-regulating center is liable to fail or become paralyzed if imposed upon too long or too frequently. This is especially the case during sudden changes of temperature. It is the abruptness which offends the peripheral nerves, and the greater the abruptness the more intensive will be the irritation which is transmitted by reflex action to other parts of the body, usually the weakest parts, and may result in driving the blood to internal organs, causing congestions and other mischief. Then again a cold draft playing on the cheek may cause neuralgia, paralysis, sore throat, bronchitis, or pneumonia, showing that cold applied locally may excite disease in the neighborhood of its application or in distant organs, and finally it may produce disease by checking the secretions of the skin.

The most agreeable temperature for average healthy adults properly clothed and performing light work is between 65 and 70 degrees Fahrenheit, and every effort should be made to avoid extremes of heat and cold. Much may be done to reduce the temperature of workshops by forced ventilation and a supply of cool, fresh air. The windows should be kept open during the summer nights, so that the rooms may be thoroughly flushed with fresh and cool air.

HUMIDITY OF THE AIR.

The atmosphere always contains a certain amount of water in the state of vapor, which varies from 30 per cent to complete saturation, or, according to temperature, from 1 to 12 grains in a cubic foot of air. The degree of atmospheric humidity is of special hygienic importance, as it influences to a great extent the cutaneous and pulmonary exhalation of vapor and in consequence also affects the animal temperature. The average daily amount of water eliminated by the skin is 2½ pounds, and about 10 ounces by the lungs. It is evident that when the air is damp it lessens evaporation, as it possesses little drying power,

and the water from the skin and lungs is with difficulty evaporated. The evaporation of perspiration, by which much heat is rendered latent, is one of the chief sources of cooling of the body. Consequently when the air is hot and moist the humidity tends to increase the effects of the heat, the blood is with difficulty kept at its proper temperature, and all the disagreeable effects of a high temperature are intensified. This condition may be so aggravated that the temperature of the body exceeds the normal degree and causes our cases of so-called heat stroke or heat exhaustion, which occurs especially on hot, sultry days.

A damp, cold, or chilly air also produces mischief, as it abstracts an undue amount of animal heat, lowers the general vitality of the system, and favors the development of diseases of the respiratory passages, neuralgic and rheumatic affections, and aggravates the severity of such attacks. We may conclude, therefore, that excessive humidity tends to intensify the effects of both heat and cold. On the other hand, excessive dryness of the air is also harmful; it increases evaporation, the skin becomes dry and chapped, and the mucous membranes of the mouth, eyes, and respiratory passages are irritated, causing so-called catarrhal conditions. For all these reasons an average relative humidity between 65 and 75 per cent has been found most healthful, and efforts should be made to maintain such a standard whenever practicable. Apart from methods calculated to accomplish these results, reliable thermometers and hygrometers are required to secure efficient control. State legislators would do well, instead of making a general provision for sufficient heat, moisture, etc., to prescribe a standard, at least in industries where such standards are practicable and can be reasonably enforced.

LIGHTING.

The natural light in workshops should be sufficient so that the eyes need not to be strained even on cloudy days. When the light is defective the objects have to be brought too near. The eyes in consequence converge, and the muscular strain thus induced causes a gradual elongation of the anterior-posterior axis of the eyeball, and nearsightedness results. In addition, it is believed by specialists that 80 to 90 per cent of the headaches are caused by eye strain. It has been found by Putzeys[1] that the natural lighting in temperate climates will usually come up to hygienic requirements when the area of windows, exclusive of sash frames, equals one-sixth of the floor space. In order that the light may penetrate the deeper portions of the room, the windows should reach almost to the ceiling and the glass should be either

[1]Cited by Munson Military Hygiene, 1901, p. 521.

pure white ribbed or prismatic and kept clean. Wisconsin is apparently the only State which has undertaken to legislate specifically upon this point, as section 3 of chapter 79, acts of 1899, provides: "Every window shall have not less than 12 square feet in superficial area, and the entire area of window surface shall not be less than 12 per cent of the floor space of such room."

The difficulty of securing a sufficient amount of daylight in buildings located on narrow streets surrounded by tall buildings has been partly overcome by glass building blocks 8 by 6 by 2½ inches, with an air chamber in the center, used instead of brick or stone, in connection with steel-frame construction, but more particularly by the introduction of prismatic glass, which refracts and diffuses the light.

ARTIFICIAL LIGHT.

No matter how obtained, artificial light differs from daylight in this, that it does not furnish a pure white light, the prevailing rays being red, yellow, or violet. Whatever difference of opinion there may be as to the color best suited to our eyes, we know that our vision is most perfect under the influence of a white light, and this ought to be a good criterion. One of the disadvantages of all low-power illuminants is that the light is never as bright as daylight, involving, therefore, closer application of the eyes and consequent strain of the muscles of the eyeball. These remarks are hardly applicable to the electric arc light and the Welsbach gas-burner, the rays of which, like the direct solar rays, may indeed be so glaring as to cause undue irritation of the retina.

Another harmful effect of artificial illumination is the unsteady or flickering character, especially seen in the electric arc light, and which on account of the abrupt changes is likely to irritate the retina. Another disadvantage is that the ordinary illuminants, except the electric light, tend to vitiate the air by the products of combustion, and also affect the temperature and humidity of the air by the heat evolved.

The requirements of a hygienic light are that it should be as near as possible the color of the sunlight, sufficiently ample but not too glaring; it should be steady, and instead of deteriorating the air it should as far as practicable be utilized to promote ventilation; nor should the heat evolved be sufficiently intense to be a source of discomfort to the inmates in warm weather. The most common methods of lighting now employed are the electric incandescent lamps, arc lights, mercury-vapor lights and electric bulbs, gaslight, and kerosene lamps. Of these, the electric lights, especially the mercury-vapor lights, are superior to gas or other illuminants because there is little or no danger

from fire, there are no products of combustion, hence no pollution of the air, nor are the temperature and humidity of the room affected to any perceptible extent. These advantages over gas or kerosene are of special importance to the inmates of the buildings where the question of fresh air and temperature plays an important role; hence many industrial plants find it profitable to install the very best type of electric lighting, and thereby save time and money by the prevention of sickness and accidents among their employees. Next to the electric light, gas, especially in connection with a Welsbach or Siemen's burner, or the acetylene gas, offers the next best choice. In the absence of either electric or gas light, kerosene with a high flashing point should be preferred over other illuminants. In all such instances suitable outlets for the products of combustion should be provided.

White, clean ceilings and walls will be of great service not only in solving the question of light, but also in general sanitation, and a number of States, notably Indiana, Kentucky, Missouri, New Jersey, and New York, require the walls to be limewashed or painted.

The sufficiency of artificial lighting may be approximately determined by observation, and quite accurately by the employment of Bunsen's method and his photometer. In this country and England, according to Munson, "the unit adopted for the measurement and comparison of lights is a No. 6 sperm candle burning 8 grams per hour and giving out a light known as '1 candlepower.'" Such a candle contains on analysis carbon 80 per cent, hydrogen 13 per cent, oxygen 6 per cent, and in combustion yields equal volumes of carbonic acid and watery vapor to the air, namely, 0.41 cubic foot.

PREVENTION OF ACCIDENTS.

About 22 States have taken steps to reduce accidents to a minimum. For this purpose they have enacted laws concerning employers' liability if they fail to provide safety devices for the movable and dangerous parts of machinery. Apart from proper screening, belting, etc., the use of respirators, wire masks, and goggles are absolutely essential for the prevention of accidents or injuries in many employments. At least 27 States require some form of protection in case of fire, by means of fire escapes and doors swinging outwardly, while a respectable number also insist upon inspection and registration of steam boilers.

A careful inspection of steam boilers and examination of engineers have materially lessened the dangers from boiler explosions, so that in England there is only about 1 explosion in 6,200 registered boilers.

It has been suggested that employees who come in contact with

moving machinery should provide themselves with suitable clothing, so fitted and arranged as to reduce the dangers to a minimum. There is an endless variety of suitable patterns in the market, of which the snug-fitting duck union suits properly buttoned and adjusted are the best. Asbestos clothing has been recommended for firemen and furnace operators; but as it is rather heavy, light leather suits or aprons are preferable, while even ordinary clothing may be rendered practically noninflammable by chemical treatment.

MISCELLANEOUS SANITARY PROVISIONS.

A number of States have enacted laws concerning general cleanliness of factories and workshops. Most of the factory laws make provisions for the necessary sanitary conveniences, such as privies, water-closets, and urinals, and where men and women are employed separate dressing rooms and water-closets are called for. Some of the States, like Wisconsin, for example, specify "that when the number employed is more than 25 of either sex there shall be provided an additional water-closet for such sex up to the number of 50 persons, and above that number in the same ratio." The author believes that there should be at least one water-closet or privy for every twenty employees.

A large number of States make seats for female employees, wash rooms, and dressing rooms obligatory, and not a few insist upon separate provisions for the sexes. The importance of personal cleanliness has been pointed out. In certain occupations the washing of the hands before eating is important, and in occupations involving exposure to poisonous dust or agents the employment of a general bath should be encouraged by insisting upon the introduction of suitable shower baths.

A few States, notably Massachusetts and Rhode Island, make provisions for "fresh drinking water of good quality." The former also regulates the spitting habit by insisting upon suitable spittoons. These and other questions, like clothes lockers and lunch rooms, and the time allowed for the noonday meals, which is already regulated in a number of States, should receive universal attention. Much industrial legislation has been enacted by State legislatures during the past ten years. Commendable progress has been made in the provision of ventilation, heating, lighting, removal of dust, and general sanitation of workshops. The need for additional improvement is shown by the Massachusetts Board of Health's survey of the work in that State, which has generally been in the lead in factory laws.

The Report of the State Board of Health, on page 4, reads:

"In many [industries] the conditions were found to be satisfactory. In the emery and corundum, sandpaper, and certain other industries

more attention should be given to keeping the dust away from the mouth and nostrils of the workmen. In the rag dusting, sorting, and cutting rooms of some paper mills very objectionable amounts of dust were found, with some pale and sickly appearing operatives; but there are mills using the same kind of stock where the dust is kept away from the employees in a satisfactory manner, and much improvement is practicable in the former class."

The same remarks are applicable to the textile industries, and the hope is expressed that the unsatisfactory conditions found in the minority of establishments will be raised to those which are now found to be good.

Reference has already been made in these pages to the conditions found in machine shops, the cutlery and tool industry, cigar, rubber, boot and shoe, and other industries examined. In the boot and shoe industry comment is made upon "four conditions which can be and ought to be remedied." These are: poor ventilation, inadequate removal of dust from machines, the conditions of water-closets, and spit upon the floors. In the majority of factories visited the ventilation was found to be poor, and in many of them distinctly bad. Of the rooms not especially dusty, 102 were badly ventilated and 26 were overcrowded. * * * Of 84 of the many dusty rooms reported, 40 were also overcrowded, 35 were dark, 21 were overheated, and 18 were overcrowded, dark, and overheated.

"In more than one-third of the factories visited the conditions of water-closets were not commendable; most of them were dark and dirty to very dirty. In 50 establishments no spitting was noticed, in 173 there was some, in 115 considerable, and in 35 much."

"In some establishments lunch rooms are provided, where employees may eat the luncheon they have brought or may buy one; in much the larger number the employees eat in the workrooms. * * * In 85 factories, or 23 per cent of those visited, a considerable proportion of the employees are noticeably pale and unhealthy."

In discussing the following provision in the Massachusetts laws, "All factories shall be kept clean," the State board of health very properly points out that "what is clean in an ax-grinding factory would not be clean in a silk mill; but the law makes no distinction, and the judgment of the officer can not be received as law." The board considers it impossible to specify in any law a standard of cleanliness applicable to all industries, and advises "that the officer should be authorized to hold all factories in any industry up to the standard of cleanliness which he finds maintained in the factories in the same industry and using the same grade of stock which are the cleanest." The same method is rec-

ommended for the enforcement of standards in other directions, subject to an appeal to the State board of health.

LODGING HOUSES AND SLEEPING QUARTERS.

It not infrequently happens that large industrial plants and contractors provide board and lodging for their unmarried employees. Again, in a number of the smaller industries the employees not infrequently board with the family and are obliged to sleep in objectionable rooms. All such provisions should come up to a reasonable standard as regards salubrity, air space, light, heat, and ventilation, and separate provisions should be required for males and females and youthful employees. Lodging houses should come up to a certain standard, and wash and bath rooms and suitable toilet facilities should be provided. Special attention should be paid to general cleanliness within and without quarters for working parties, and to the character and preparation of food.

PERMANENT EXPOSITIONS DEVOTED TO INDUSTRIAL AND SOCIAL BETTERMENT OF WAGE-EARNERS.

It will require time and patience to bring employers and workers to a full realization of the dangers incident to the various occupations and to a thorough appreciation of the methods which have been proposed in the way of factory sanitation, safety devices, etc. Good results abroad have been accomplished by a permanent exposition devoted to social and industrial betterment for wage-earners. Such an exposition was provided for by the German Parliament a few years ago, and a similar effort is now being made in the city of New York. The German exposition occupies a building specially erected for the purpose at Charlottenburg, a suburb of Berlin, and here every safety appliance which inventive genius has devised can be seen in practical operation. The different labor unions appear to profit immensely by the special lectures and demonstrations which are given on Sundays or, upon request, at any convenient time, by men formerly employed in "dangerous occupations." Apart from safety devices for machinery and appliances for removal of dust and injurious gases, all improved methods calculated to diminish danger, as, for example, in the manufacture of white lead, etc., are illustrated by models and descriptive text, printed leaflets being distributed free of charge. Here, too, may be seen the best and most recent types of respirators, wire masks, goggles, illuminating appliances, and safety working suits. Inventors and designers esteem it a great honor to have their products admitted for exposition. Only meritorious

objects are displayed, and they are replaced by the newer and more satisfactory types. One of the most interesting collections consists of a series of bottles containing diffierent varieties of dust, a series of photographs showing the microscopical character of this dust, and, last, but not least, anatomical specimens and microscopical slides showing the effects of dust upon the air passages and lungs of the human subject. Models, plans, and photographs of tenements and model homes for wage-earners, exterior and interior decorations, literature and charts concerning industrial betterment, all find a prominent place in the exhibit. The display of food stuffs, their nutritive and economic value, together with instructive leaflets, form part of this interesting exposition. A popular pamphlet seen at the exposition in September, 1907, was compiled by Professor Kalle and Doctor Schellenberg, entitled "How to keep well and capacitated for work," which is sold by the Society for Popular Education at 2½ cents a copy, over 470,000 so far having been sold.

WHAT THE FEDERAL GOVERNMENT MAY DO FOR THE PROMOTION OF THE WELFARE OF ITS EMPLOYEES, ETC.

Much excellent work has been and is being done by the United States Bureau of Labor in the collection and publication of facts concerning every phase of industrial and social betterment. These bulletins are issued bi-monthly, and if carefully read can not fail to exert a tremendous educational influence upon those for whom they are primarily intended, viz., the wage-earners and employers. But while much has been achieved more remains to be accomplished. It seems to the writer that apart from establishing, in connection with the National Museum, a permanent exposition relating to industrial and social betterments of wage-earners, it is clearly the duty of the Federal Government to establish and adopt a standard of industrial hygiene for all the Government workshops.

President Roosevelt in a message to Congress, December, 1907, has said, "the National Government should be a model employer. It should demand the highest quality of service from each of its employees and it should care for all of them properly in return. Congress should adopt legislation providing limited but definite compensation for accidents to all workmen within the scope of the Federal power, including employees of navy yards and arsenals."

We regret to say, that with the possible exception of the extraordinary efforts and special precautions exercised to protect the health and general welfare of the employees in the operations connected with the

construction of the canal on the Isthmus of Panama, the sanitation of offices and workshops in this country proper, for Government employees, is not even on a par with some of the best private industrial concerns. There can be no question that model Government workshops and efforts for the promotion of the general welfare of the employees would prove a salutary precept and example. The General Government is not in a position to legislate for the States, but it can at least enact a model labor and factory law for the District of Columbia, and all of the workshops connected with the Army and Navy arsenals, gun-factories, powder depots, clothing depots and the immense army of labor employed on the Isthmus of Panama.

Apart from strictly sanitary measures for the promotion and preservation of health, the Government, as a model employer, should provide some adequate relief in case of sickness, accidents, or disability from disease or injuries contracted in the line of duty. As it is now, the Government merely grants one month's sick leave to officials and office employees, none to workmen employed in Government shops, and in case of accidents the employee or his dependents have no remedy except recourse to the courts of law.

While it is true that Government employees in many instances have banded together for the purpose of establishing sick benefit and relief associations, such organizations lack official control and do not always embody the most advanced principles of social and political economy.

GERMAN WORKINGMEN'S INSURANCE SYSTEM.

Industrial Insurance.—For reasons briefly stated, the Federal Government would do a wise act, by creating the so-called industrial insurance system, for the sick, for accidents, disability and old age, for its own employees and others in the District of Columbia, and thus initiating a system which has proved to be a veritable blessing in many of the European countries. Any one who desires to become familiar with the "German workingmen's insurance" should not fail to read a digest in the Bulletin of the Bureau of Labor No. 53, July, 1904, page 941, and Professor Henderson's "Summary of European Laws on Industrial Insurance." (Charities, December 7, 1907, page 1191.)[1]

Under the operation of the German law, enacted in 1883, all workmen employed in commerce, industry and the handicraft trades, and whose wage is less than 2,000 marks (about $480) must be insured. By special regulations this requirement may be extended to agricultural and household employees. To secure the enrollment of individuals "for

[1]The writer is indebted to these sources for much of the information on this subject and gratefully acknowledge this indebtedness.

sick benefits," the employers in the industries subject to the law are required to send to the proper insurance fund the names of each person who enters or leaves their service.

The income of the sick funds is derived from the dues of members—the amount is fixed by each local association, but cannot exceed 6 per cent of the members' wages. The employee pays two-thirds of the dues and the employer one-third. The employee's share is deducted from his wages and paid direct to the insurance fund by the employer, when he remits his own share.

The benefits offered by the sick funds vary in amount, but all of them are required to provide the following as a minimum: 1, Free medicine, attendance and treatment; 2, In case the sickness causes inability to work, the fund pays a sick benefit equal to one-half the wage rate which was used in calculating the member's dues. This benefit begins the third day after the disability sets in, and continues for 26 weeks. Instead of receiving medical treatment at home a member is entitled to treatment at a hospital, in which case an amount not exceeding one-half of his daily wage is paid to his dependents. Female members receive similar benefits for a period of six weeks following confinement. 3, In case of death, a funeral benefit equal to twenty times the amount of his daily wage is paid to the heirs of a member.

In 1904 there were 22,912 local sick and miners' provident associations in the German Empire with 11,400,000 members, practically one-fifth of the population. The disbursements amounted to 237,107,000 marks (about $56,470,000). Of this amount 106,000,000 marks (about $25,238,000) was paid for sick benefits and the remainder for medical and hospital treatment, convalescence and funeral benefits.

Accident Insurance.—Under the provisions of the laws of 1884, 1887 and 1900 all workingmen and technical experts engaged in industry, agriculture, forestry, transportation and coast fisheries earning less than 3,000 marks (or about $715.00) per annum are required to be insured against accident. By special enactment it may be extended to foremen and petty employers with more than 3,000 marks income. This form of insurance is administered by associations of employers known as "mutual trades associations," subject to Federal supervision. In 1904 there were 114 associations, including 5,300,000 establishments and 17,500,000 workmen. The workingman's share of the expense of the accident insurance consists of the benefits paid out of the sick insurance fund to the injured person during the first thirteen weeks of disability. The share of the employer is determined from the amount of his pay roll and the danger rate of occupation. Beginning with the fourteenth week the trades association provides: 1, Free medical treatment; 2, A

pension during the continuation of the disability, whether the disability is partial or complete. In case of complete disability the pension is equal to two-thirds of the earnings of the injured person; in case of partial disability the insured receives a fraction of the above pension, proportioned to the degree of disability.

In case of a fatal accident, the law provides for: 1, A funeral benefit of not less than $12.00; 2, A pension to the dependents of the deceased, including parents, beginning with the day of death. The widow and each child up to the age of 15 receives 20 per cent of the earnings of the deceased, though the sum of these pensions may not exceed 60 per cent of such earnings.

Premiums paid in 1904 were $35,592,000.00; disbursements, $30,552,000; viz., to 758,392 injured members, to 65,503 widows, 97,246 children, and to 3,647 parents of those killed.

Invalid and old age pensions were made compulsory under the German law of 1889 (revised in 1899) for all wage-earners with an income of less than $480.00 per annum; the provisions may also be extended to include petty employers and persons in household industry. The invalid pension is paid without regard to age to those persons whose earning capacity has been permanently reduced to less than one-third. The pension is also paid to those who have been in a state of disability for 26 weeks and continues as long as the disability lasts. To be eligible for this pension, the insured person must have been a member of the "insurance institute" for 200 weeks, during which time not less than 100 payments of weekly dues must have been made. If the disability has been incurred purposely the right to a pension ceases and the offender is liable to criminal prosecution.

In addition to the pension from the "insurance institutes" the Empire grants a stipend of 50 marks (about $12.00) per annum to invalids, as well as persons over 70 years of age.

Members are divided into five classes on the basis of wages received. Each class pays a different rate of dues and receives benefits in proportion. The lowest invalidity pension granted is $27.70, the highest is $107.10 per annum. The dues range from 3 1-3 cents per week, according to the wage-class in which the member is enrolled. One-half of the amount is paid by the employer and one-half by the employee.

The old age pension is paid without regard to earning capacity when the seventieth year of age is completed. Members must have paid dues for 1200 weeks before they become eligible for such a pension. In 1904 there were 40 invalid pension organizations, with 13.8 million insured members. Premiums paid in $36,960,000; disbursements, $35,520,000. The average invalid pension is $37.20, and the old age pension $37.68, varying in amount with the wage-class.

The financial soundness of the system is secured by making the employers, the guilds and parishes eventually responsible for any deficit in the various sick insurance organizations. The national, State and local governments guarantee the payment of claims against the accident and invalidity insurance organizations.

Synopsis of practical results. The financial status of the workingmen has been improved at least to the extent of the benefits received from the amounts contributed by the employers and the government. Experience has shown that employers have not deducted their share of the dues from wages.

The hygienic conditions of the workingmen have been improved, both on account of the safeguards which the accident insurance organizations require employers to use and because of the special efforts made by the "sick funds" to reduce the sick rate among the members to a minimum. The general knowledge in regard to the preservation and promotion of health, which the "sick fund organizations" have disseminated by means of circulars, monographs, popular lectures, etc., have exerted a tremendous educational influence in the promotion of health and morals. One of the most beneficent features of the entire system has been that parts of the funds of these organizations are invested in model-houses, hospitals and sanitoria for the use of members. The writer, during his visit to Berlin in the autumn of 1907, had occasion to inspect some of these workingmen's houses, as well as the most complete and elaborate sanitorium in the world, at Beelitz, near Berlin. The object of this is to provide the very best facilities for the speedy recovery and the restoration of earning power of the industrial wage-earner. Dr. Bielefeldt (Med. Reform, 15th Jahrg, 1907, page 238) calculates, that in the treatment of 159,802 tuberculous patients, between 1897 and 1906, the net gain in spite of an expenditure of fifty-six million marks amounted to more than four and one-half million. It is interesting to note, that the Prussian "insurance institutes and sick funds" in 1907 alone maintained 28 hospitals and sanitoria, the latter chiefly for consumptives and convalescents. One of the latest features was the establishment in 1902 of a special hospital for sexual diseases in the male, at Lichtenberg, near Berlin, and a sanitorium for nervous and anæmic female wage-earners in Pyrmont (Hannover); all upon the principle that it is in the highest degree good economy to restore as speedily as possible the unproductive to the ranks of the producers. Some conception of the good work may be found by a brief description of the sanitorium at Beelitz, which was erected in 1902 by the "insurance institute" of Berlin at a cost, according to report of Directors, June, 1907, of 15,287,994 marks.

Average number of patients, 413 males and 203 females; number of cases treated in 1906, 4,192; number of hospital days, 212,457; expense for 1906, 1,470,062.25 marks, or at the rate per capita per day of 6.92 marks. One portion of the institution is devoted to the treatment of incipient cases of tuberculosis; another, and entirely detached department, to cases of every description requiring high-grade sanitorium treatment in order to prevent premature invalidity. Each of the handsome and spacious pavilions accommodates 200 males or 100 females; apart from these are four porter's lodges for the four departments under separate enclosures, 1 general administration building, 1 central power and heating plant, 1 central bathing establishment, 1 disinfecting plant, 3 pumping stations, kitchen, laundry, workshops, quarters for medical officers, employees, bowling alleys, hothouses, stables, etc. The hospital staff consists of 10 physicians and 128 employees.

The writer was informed, in September, 1907, that since the establishment of the "'sick funds" and "insurance institutes" in Germany, poverty has decreased and the number of patients treated wholly at public expense has markedly diminished, as workingmen even of the humbler classes prefer to devote their sick benefits to hospital care, rather than be a charge upon the parish or country.

INCOME, EXPENDITURES, AND INVESTED FUNDS OF THE INSURANCE SYSTEM

Items.	Sick insurance, 1901.	Accident insurance, 1902.	Old-age and invalidity insurance, 1902.	Total of all insurance, 1885 to 1901
Dues of employers	$13,952,723	$29,907,868	$16,539,308	$508,445,565
Dues of employees	31,126,584	.....	16,539,308	487,147,059
Subsidy of imperial government	.....	.....	9,008,227	51,049,907
Interest and other income	2,604,130	3,743,936	8,054,310	93,588,044
Total income	47,683,437	33,651,804	50,141,153	1,140,230,575
Expenses for relief	43,595,450	25,735,679	28,658,559	755,015,720
Cost of administration	2,590,837	3,965,983	2,843,541	79,993,721
Total expenditures	46,186,287	29,701,662	31,502,100	835,009,441
Invested funds	44,421,557	47,408,235	239,779,652	309,020,248

Effects of the Insurance System on the Employer and Consumer.—The foregoing table shows that the system has materially added to the financial burdens of the employer, but it is believed that they have not been too heavy, at least they have not injured Germany's ability to compete in foreign markets.

One authority estimates that the amount paid by the employer for accident insurance is 3 per cent of the wages, for sick insurance 1½ per cent of the wages, and for old age and invalidity insurance, 1 per cent, or a total of 5½ per cent of the wages added to the cost of production.

Dr. Lass, of the Imperial Insurance Office, concludes, however, that this burden has not been shifted to wages, nor has it resulted in higher prices to the consumer, but has been made up by improved methods of production.

The writer has purposely devoted much space to the German industrial insurance system, because he realizes that sickness and funerals are the most potent causes of poverty and distress; he knows from personal knowledge that prior to 1883, Germany depended upon employers' liability laws, charitable organizations and private companies for the protection of her wage-earners, with very questionable results. While much has been achieved in other directions for the prevention of disease, the most distinct gain in social-political endeavors was made by the enactment of these laws, and especially the law of June, 1889, authorizing "insurance institutes" to invest part of their funds in hospitals and sanitoria, thus affording the best possible facilities for the speedy recovery and the prevention as far as practicable of permanent disabilities.

According to Zacher (Leitfaden zur Arbeiterversicherung des Deutschen Reiches, 1906) quoted by Professor Henderson, "at the end of 1905 in all 70 million pensioners (sick, injured, invalids and their dependents) had received $1,200,000,000 in benefits. The workmen have contributed less than one-half of the premiums, and have received $480,000,000 more than they have paid out. Property is owned to the amount of $408,000,000, of which $120,000,000 have been invested in workmen's dwellings, hospitals and convalescent homes, sanitoria, baths and similar institutions of welfare."

There is no pauperization in a method where the beneficiary contributes such a large share to the undertaking. As a matter of fact, methods in vogue in our own country are calculated to shift all of the burden upon the tax-payer.

For a more complete exhibit, the following tables are reproduced from Professor Henderson's article in Charities, December 7, 1907:

Sickness Insurance (since 1885)	*Marks*	
Sickness payments	1,114,629,489	=$267,500,077.36
Physicians	514,803,920	=$123,552,940.80
Medicines, &c.	402,757,651	=$ 96,661,836.24
Hospitals	303,061,148	=$ 72,734,675.52
Death benefits	83,763,839	=$ 20,103,321.36
Lying-in-women	36,543,672	=$ 8,770,481.28
Various benefits	38,414,074	=$ 9,219,377.76
1888-1904	$ 2,493,973,763	=$598,553,710.32
1905	250,000,000	=$ 60,000,000.00
In round numbers	2,744,000,000	=$658,560,000.00

Accident Insurance (since 1885)	*Marks*	
Accident benefits	759,172,928	=$182,201,502.72
Payments to dependents of diseased	191,777,559	=$ 46,026,614.16
Medical care	34,275,716	=$ 8,226,171.84
Hospitals	55,010,333	=$ 13,202,479.92
Death benefits	6,927,990	=$ 1,662,717.60
Widows	7,747,570	=$ 1,859,416.80
Foreigners	2,846,489	=$ 683,157.36
1885-1904	1,057,758,585	=$253,862,060.40
1905	136,000,000	=$ 32,640,000.00
In round numbers	1,194,000,000	=$286,560,000.00

Invalid and old age pensions (since 1891)	*Marks*	
Invalid pensions	560,486,961	=$134,516,870.64
Old age pensions	336,472,378	=$ 80,753,370.72
Medical care	55,371,747	=$ 13,389,219.28
Return of premiums (a) at marriage	38,025,117	=$ 9,126,028.08
Return of premiums (b) at death	13,422,508	=$ 3,221,401,92
Return of premiums (c) at accident	171,201	=$ 41,088.24
1891-1904	1,003,949,912	=$240,947,878.88
1905	162,000,000	=$ 38,880,000.00
In round numbers	1,166,000,000	=$279,840,000.00

It is sincerely hoped that the wage-earners of this country may profit by the experience elsewhere, by the adoption of a similar system, and thus avoid the dangers and losses to which they are now so frequently subjected by unscrupulously managed insurance concerns.

There appears to be no good reason why the National Government should not inaugurate such a system for its own employees. In this connection it may be well to refer to a most successful precedent in the establishment of the United States Soldiers' Home in Washington. This institution was founded in 1851 with $100,000.00 paid as indemnity by the city of Mexico. Every soldier is taxed at the rate of 12½ cents per month, which is deducted from his pay. This together with the fines from courts-martial and forfeited pay from deserters is turned into the treasury of the home. The home now owns property costing over $2,500,000.00, accommodates 950 inmates, pays a commutation at the rate of $8.00 per month to soldiers having dependents and unable to avail themselves of the privileges of the home, amounting to about $20,000.00 a year, and still has a reserve fund of about $4,000,000.00.

WHAT THE EMPLOYER MAY DO FOR THE WELFARE OF EMPLOYEES.

It has been stated at the outset that social betterment cannot be dissociated from industrial betterment, and it is here that the employer can do much for the welfare of his employees. Apart from a cheerful compliance with the laws and ordinances which may, from time to time, be enacted for the protection of the working classes, it is clearly the duty of the employer to promote in every way the efficiency and earning

power of the wage-earner and to pay such wages as are necessary to improve the standard of living among poorly paid employees.

There is no doubt that thoughtful employers generally realize that they are not only responsible for the proper technical training of apprentices, but also for their habits, and a gratifying number of establishments have made every effort to surround them with all possible chances for improvement, mentally and morally. There is a class of youthful employees, both males and females, for whom the writer begs to enter a special plea; they are entitled to every consideration, because, either as a result of inheritance or faulty environments they have acquired a general inaptitude; they are perfectly willing to work, but awkward in all their movements—simply do not know how to work—and soon exhaust the patience of their instructors.

Such persons are found seeking to make an honest living in nearly all occupations, and while they may be better adapted to some employments than others, to discharge them without a fair trial means their utter ruin. Here appears to be a field for human sympathy, and special pains should be taken to teach them, by patient fellow workmen, how to handle tools and work to better advantage, whether it is with the pick or shovel, at the ploughshare, the street or house broom, or in the diversified employments of artisans' workshops.

Industrial Betterment.—Space will not permit to enter into details concerning efforts which have been made at home and abroad in the promotion of the general welfare of the working classes. At a meeting of the American Social Science Association, held in Washington, April 18, 1901, Mr. J. H. Patterson, Dayton, Ohio, read a paper on factory sanitation and described a large manufacturing plant of which he is the head, and their close adherence to the principles of hygiene and the uplifting of mankind. The interior of the factory is painted in cheerful colors, extra windows were made to give light, forced ventilation to afford plenty of fresh air, and all dust and acid fumes are carried away by exhaust fans. Bathrooms and well furnished toilet rooms are on all the floors. All seats have backs. Clean aprons are furnished by the company, and a dining room where hot meals are served and a course in domestic economy is conducted. The grounds around the factory, and the houses of the employees, are healthful and attractive. "We have demonstrated," said Mr. Patterson, "that this system pays the employee, the manufacturer and the buyer, in the health of one, profit of the second, and the improved quality of the product purchased by the third." Bulletin No. 31, Department of Labor, November, 1900, contains an article on betterment of industrial conditions, showing what has elsewhere been accomplished, every effort being in the right direc-

tion. Among the most important may be mentioned: 1, The increasing of industrial efficiency through industrial schools and manual training classes; 2, The care for employees' health and comfort by means of bathing facilities, gymnasiums, calisthenics, baseball, bicycle clubs, dining and lunch rooms, the furnishing of hot lunches free, or at cost, improved sanitary conditions and appliances; 3, The improvement of domestic conditions by means of improved dwellings, instruction in sewing, cooking and housekeeping, in landscape and kitchen gardening, and the exterior and interior decorations of homes; 4, The care of sick and disabled employees and their families by means of free insurance, medical attendance and hospital facilities and by the encouragement of beneficial organizations; 5, Club organizations for social, recreative and intellectual purposes by means of free lectures, libraries, kindergartens and educational classes, social gatherings, summer outings, meeting places, game rooms, banquets, dances, etc.; 6, The encouragement of musical and dramatic clubs and the promotion of spiritual life by means of Sunday-schools and general religious work; 7, The cultivation of thrift through savings bank facilities, building associations, or provident organizations, rewards for valuable suggestions of employees, for faithful service or the manifestation of zeal and interest in their employment; 8, The promotion of employees' personal interest in the successful conduct of the business by encourgaging and assisting them to purchase shares, financial aid to employees in case of unusual hardships and distress, and the cultivation of cordial and even confidential relations between employer and employees.

(For details consult Bulletin of the Department of Labor No. 31, pages 1117-1156). It is gratifying to note that, although Washington is not an industrial center, a large number of firms have taken steps for the promotion of the general welfare of employees.

WHAT THE GENERAL PUBLIC MAY DO.

There is a tendency at present among young men, the sons of parents who have accumulated some means, to expect to live and grow rich without manual labor. It is becoming fashionable to look upon the mechanic with disdain, to consider manual labor degrading, an evidence of low breeding and all such nonsense. The young men want to be book-keepers, bankers, lawyers, doctors, or office holders, anything which does not involve manual labor, and expect their fathers to furnish the means to attain the goal of their ambition; as a result the professions are overcrowded and men fail who might have been successful in the handicrafts. Let us teach our children to respect and perform hon-

est labor, whether it is behind the ploughshare, in the saddle, or in the workshops. It will teach them self-reliance, prudence and perseverance.

It will be conceded, that the burdens of improving industrial and social conditions should not be carried by the employer and employees alone. There are many phases of vital importance from the standpoint of public health and humanity, which should concern every thoughtful man and woman. Reference has already been made to the appalling and dangerous conditions under which many of the trades and occupations are carried on in tenement houses. While this is, in part, due to the greed of the manufacturer, because it means less factory space, less rent, light, fuel, and a decidedly smaller pay-roll, the consumer is equally to blame, because of his constant demand for cheaper goods, quite oblivious to the fact that the garments may be a source of danger from infectious diseases, and are stained with the sweat and blood of helpless women and little children.

During one of the Presidential campaigns, a clever orator referred to Glasgow and told us, that 41,000 of the 100,000 laboring families of that manufacturing center lived in one-room tenements, and that this one room for a family of father, mother, daughters and sons, told what the wages in Scotland were and how they dragged humanity down into bestiality and misery. We need not go to Glasgow for such illustrations, for to our shame, it must be confessed, that similar conditions obtain in nearly every American industrial city. The effects of such conditions upon death rates will be presently referred to. In the meantime, it will be readily conceded that the people do not live as a rule in such quarters from choice, but from sheer necessity. Low wages compel the working classes not only to find shelter in houses unfit for human occupation, but also affect their health and the health of their children by insufficient food and clothing, and last, but not least, it means the utilization of child and female labor in some of the most atrocious forms referred to on another page. Indeed there is much reason for assuming that low standards of living, which insufficient wages tend to beget, play a very important role in physical, mental and moral degeneracy. "Physical health is the basis of mental health." This aphorism of Aristotle has been proved to be true by the experience of every educator.

Professor Dawson, in his study of youthful degeneracy (Pedagogical Seminary, vol. IV, page 2), found among the boys and girls in reform schools evidence of physical degeneracy as shown by lighter weights, shorter statures and diminished muscular power, and declared that 16 per cent of those examined by him were "clearly sufferers from low nutrition." It is to be hoped that the public conscience may be

sufficiently aroused to insist upon adequate wages for all classes, and that the producer and consumer alike will be willing to assume this responsibility, not as a matter of charity, but in justice to the laboring classes.

In the whole range of social betterment and sanitation, especially in our efforts to combat tuberculosis, no field affords better opportunity for philanthropic work than the erection of sanitary homes for wage-earners, at reasonable rentals, the encouragement of cooking schools and the establishment of model lodging and eating houses. The New York City and Suburban Homes Company has now for dividend disbursements 4.5 per cent a year on an investment of $5,500,000. The Washington Housing Companies have an investment of over one million, have paid respectively 4 and 5 per cent from the very inception of the companies, and have a surplus fund of over $100,000.00. London has more than $100,000,000 invested in model tenements.

Houses for Wage-earners.—The housing of the working classes has very properly been made the subject of legislation in many countries, and is a matter in which factory owners, labor unions and the general public should be deeply and mutually interested. There are several systems of dwellings for artisans and laborers, viz., individual houses or cottages, a row of houses under one roof, and the so-called "flats." Preference should be given, when practicable, to the cottage system, but in large cities unfortunately the value of real estate frequently compels the erection of large tenements, and in such an event the State should insist upon hygienic requirements as regards air space, light and ventilation. No home can be considered sanitary where one room has to answer the purposes of a living room, sleeping room and kitchen, or where the water-closet or privy is used by more than one family.

Evil Effects of Insanitary Houses and Overcrowding.—The primary object of habitations is to secure protection from the influence of heat, cold, rain, sunshine and storms, and thus promote the health and happiness, and indirectly also, the morals and culture of the human race.

The influence of sanitary houses can not be overestimated. Dr. Villerme, in an investigation in France from 1821 to 1827, found that among the inhabitants of arrondissements containing 7 per cent of badly constructed dwellings, 1 person out of every 72 died; of inhabitants of arrondissements containing 22 per cent of badly constructed dwellings, 1 out of 65 died, while of the inhabitants of arrondissements containing 38 per cent of badly constructed dwellings, 1 out of every 15 died.

With the present rapid transit facilities in every city, our voice should be clearly in favor of individual homes; and when this is impracticable, we should insist on broad streets and deep yards. No

more than 68 per cent of the lot should be covered by the house, and the height of the building should never exceed the width of the street. The baneful effects of tenement-houses should be avoided, as infectious diseases are more liable to spread in consequence of aerial infection and the more intimate contact of the occupants.

Apart from structural defects, there is no doubt that the death rate is largely determined by the number of occupants to a room. Russell has shown that in Glasgow, when the average number of persons to each room was only 1.31, the mortality was 21.7 per 1,000, and when the number of occupants amounted to 2.05 for each room, the mortality reached 28.6 per 1,000.

According to Korosi, the mortality from infectious diseases at Budapest is only 20 when the number of occupants to each room does not exceed 2, but is 29 per 1,000 with 3.5 occupants, 32 per 1,000 with 6.10 occupants, and 79 per 1,000 when there are more than 10 occupants to each apartment.

The death rate at Berlin, in 1885, among the 73,000 one-room tenants was 163.5 per 1,000, against 5.4 per 1,000 among 398,000 residents occupying four-or-more-room apartments.[1] The analysis of 2,701 infantile deaths in Berlin during 1903, investigated by Neumann, has been presented elsewhere in this work.

Insanitary dwellings are to be found everywhere, and particularly in older cities erected at a time when the principles of sanitation were comparatively unknown. One of the most important municipal problems is to correct existing evils by the enactment and enforcement of suitable laws. It requires, however, a strong public sentiment to bring about a complete and satisfactory reformation, as evidenced by the housing movement elsewhere, for in spite of the excellent tenement-house laws in New York, according to Homer Folks, of 370,000 dark rooms reported in existence by the De Forest Tenement-house Department in 1903, some 20,000 only have been opened to the light during the past 3½ years. The prohibition against the use of cellar and basement rooms partly under ground cannot be enforced, owing to the lack of a sufficient number of inspectors. The notorious "Lung Block" continues to contribute its horrifying quota to the annual mortality. (Charities, November 30, 1907).

The writer has no hesitation in declaring that the housing conditions of the least resourceful of people have been, and are even now, more potent than any other factor in helping to swell the frightful mortality from consumption and other so-called house diseases engendered by unwholesome environment.

House Diseases.—It has long been known that rickets, scrofula

[1] Town and City, Jewett, p. 14.

and other chronic forms of tuberculosis are especially prevalent in dark, damp and insanitary houses. The children are anæmic and as puny as plants reared without the stimulating effects of sunlight. Add to this the fact that dampness abstracts an undue amount of animal heat, lowers the power of resistance and favors the development of catarrhal conditions, which render the system more vulnerable to tuberculosis, and we have a reasonable explanation why these diseases prevail, especially in basements or houses below grade and otherwise unfit for human habitation. The death rate is often double and treble that of other localities, and while there are doubtless other factors which determine the frightful mortality, none are more potent than deficient sunlight and ventilation. Diphtheria, cerebro-spinal meningitis, acute and chronic rheumatism, and bronchial affections are also more frequent in insanitary dwellings.

That the same is true of infantile diarrhœa, is doubtless due to the fact that the construction of the buildings does not protect from the heat of summer, and the enervating effects of heat and the more speedy decomposition of food (especially of milk), in such an atmosphere, combine to carry on the slaughter of the innocents.

The existence of disease-breeding habitations is a reflection upon Christian civilization, and there should be sufficient human sympathy to provide decent, healthful homes for our wage-earners, who constitute, after all, the bone and sinew of the country; and this is one of the occasions when we may well act as our brother's keeper.

The history of improved dwellings reveals everywhere a lessened death rate, and the experience of the Washington Sanitary Improvement Company is equally gratifying. During the year ending December 31, 1906, the apartments were occupied by 778 adults and 380 children, total 1,158; births, 39 and only 16 deaths, 10 adults and six infants, a death rate of about 13.7 per 1000—which, with all due allowance for the average age of the occupants, shows a remarkably low mortality, when compared with the general death rate among the white population of 15.16 per 1,000.

The regeneration of the housing conditions for the least resourceful people is the great sanitary and social problem of the twentieth century.

Take away the hovels and filthy places, let sunshine and pure air circulate through their homes, and teach them habits of cleanliness and responsibility, and the first step towards the elevation of the degraded and the education of the ignorant will be taken, not only in the warfare against tuberculosis and other diseases engendered by insanitary surroundings, but also in the battle for higher moral and social standards.

Lodging Houses or Homes for Wage-earners.—Those who have read "The Long Day" cannot fail to be impressed with the just criticism of our present system of homes for working girls. The author makes a strong plea for homes designed after the Mills Hotels for working men; no charity, but so built and conducted that they will pay a four per cent rate of interest upon the money invested. "A clean room and three wholesomely cooked meals a day can be furnished to working girls at a price such as would make it possible for them to live honestly on the small wages of the factory or store. We do not ask for luxuries or dainties. In the model lodging house there should be perfect liberty of conduct and action on the part of the guests, who will not be "inmates" in any sense of the word, so long as the conventions of ordinary social life are complied with."

It is to be hoped that her simple but truthful story will be read and her appeal for industrial and social betterment answered. So long as the conditions described in the book exist, so long will it be wicked to rear magnificent and costly church edifices, and in this respect Christian civilization, which should be a strong factor in uplifting and regenerative influences, has been remiss in its sacred obligations. To supply the needs spoken of, together with the establishment of cooking schools and kindergartens, so that the children of toil may at least have an opportunity to learn to work intelligently, may be regarded as a suitable field for practical Christianity, and would do much towards narrowing the breach which now exists between the church and wage-earners, and between capital and labor.

Food for the Working Classes.—While the character and variety of food now served is very much better than it was fifty years ago, it is not what it should be, especially in lodging houses. The chief faults consist in improper cooking and the widespread error of consuming a cold dinner from the lunch basket or dinner bucket.

The art of cooking and how to supply good wholesome food and in proper quantities should be made the subject of popular instruction. The "Ladies Sanitary Association of England," deserves credit for having taken this matter in hand, especially since experience teaches that nothing prevents the abuse of alcohol so much as a sufficient and palatable supply of food.

The establishment of public kitchens and eating-houses for unmarried laborers, conducted upon practical sanitary and economic principles, would prove a great blessing; the same may be said of lunch rooms, where rolls, sandwiches, a cup of coffee, tea, milk, hot soups, etc., may be obtained at a nominal cost, and which would materially lessen the evils of intemperance.

Since coffee and tea allay thirst, and are stimulants, without the depressing effects of alcoholics, there is no reason why factories and workshops should not supply these beverages at noon to employees at actual cost. The subject of food and cooking will be discussed in a special paper.

WHAT THE EMPLOYEE MAY DO TO CONTRIBUTE TO HIS OWN WELFARE.

Sufficient has been said in the preceding pages to indicate the dangers to which the working classes are exposed in many industrial pursuits, and the methods proposed to alleviate the effects have also been pointed out. It must be conceded that all remedial efforts have been prompted by the true spirit of humanity and as a social duty; hence it is reasonable to expect that wage-earners should show a willingness to avail themselves of the various "safety devices" and not underrate their importance in the protection of life and limb. While it is criminal for employers not to provide suitable protection, it is equally culpable on the part of the operatives to disregard all such preventive measures. So, for example, it is not a pleasing reflection to be told by Dr. Harrington, professor of hygiene at the Harvard Medical School, in speaking of respirators, that "Aside from the discomfort caused, the operatives have another and a senseless objection to their use; women complaining that they are made to look ridiculous, and men being moved to discard them by the gibes of their more reckless fellows." During the past two weeks, the writer visited Frankford arsenal and found men working in high explosives without rubber gloves and respirators, although provided by the Government. (See page 21). Dr. Farrand, Secretary of the National Association for the Study and Prevention of Tuberculosis, also spoke to me of the great difficulties he and others have encountered in New York and New Jersey, in inducing the operatives to give safety devices a fair trial.

Part II.—PERSONAL HYGIENE.

It is a matter of constant observation that families, even with a modest income, get along very well until sickness and death enters the once happy home; and if these financial burdens and sorrow can be prevented, it is clearly our duty to do so, even if the "chief bread winner" is not himself incapacitated for work. For these reasons the writer offers a few suggestions along the lines of general and personal hygiene, with the hope that they may serve to diminish human suffering and distress. In doing so, while utilizing his own lecture material,

he has not hesitated to avail himself of the valuable brochure by Professor Kalle and Dr. Schellenberg "How to keep well and capacitated for work," Berlin, 1907, because the subject-matter and general style is specially adapted for popular education.

House and Home.—Special pains should be taken in the selection of living quarters, no matter how humble they may be, as they constitute our abode for the greater part of our life. With the excellent motor facilities, there is no reason why crowded tenements should be chosen, and preference should always be given to individual homes, or apartments, in not exceeding two-story tenements. The Germans have an old but true proverb: "Where the sun does not enter the doctor surely will," hence dark, gloomy and damp houses should be avoided; mouldy spots on the walls or ceilings and a close musty odor indicate dampness, and cheap rents should prove no inducement to occupy such quarters. Leaky roofs and down spouts, or a pile of ashes against a brick wall, may keep the house damp, and the causes should be promptly removed. In all such instances, as well as in the occupancy of a recently constructed house, it is very desirable to dry out the house by heat and open windows.

Since we know that the mortality from contagious diseases increases in proportion to the number of inmates of the rooms, hygiene requires that, even the most modest dwellings, should afford sufficient room to prevent overcrowding. Ventilation is always necessary, but open windows are especially indicated at night, as nothing can take the place of pure fresh air in small quarters. This may be effectively accomplished without the danger of draughts by opening the window in the bedrooms from the top, and those of the adjoining room at the bottom. Night air, contrary to popular opinion, is not unwholesome. The only danger is from mosquitoes, which should be excluded by proper screening of windows and doors.

There are many families who properly insist upon having a sitting room or parlor, which is most commendable, if the bedrooms are large enough to afford 500 cubic feet of air space for each occupant. If they do not it is desirable, after proper airing of the larger rooms, to utilize them for sleeping purposes, for it must be remembered that the air of habitations is vitiated by the consumption of oxygen and the exhalation of carbonic acid. The airing of rooms is even more essential in cold weather, because of the additional pollution by carbonic acid from light and fires. There are a number of families, unfortunately, who for various reasons are obliged to live, cook and sleep in one room, and for whom the question of fresh air is therefore of vital importance. Such families should not hesitate to avail themselves of

the benefit of fresh air, especially when medical science has demonstrated the advantages of fresh and even cold air in the treatment of consumption and pneumonia, provided the body is kept warm by sufficient bed clothes.

Household dust is as objectionable in many respects as the dust of workshops, because dust and germs always go hand in hand. So, for example, Uffelmann found, that while the outer air contained only 250 germs in 10 cubic feet; the air of his library contained 2,900; of his sitting room, 7,500; of his bed room 12,500, and the air of a living room of a workingman's family, as many as 31,000 germs. He also demonstrated that they increased after disturbing the dust of the rooms by feather dusters or by slamming the doors, showing that they actualy cling to the household dust. If the dust should happen to contain the germs of tuberculosis, from carelessly expectorated sputum, or which may have been carried into the house upon the soles of footwear, bottom of skirts, etc., such dust may prove a source of danger, especially to children.

House Cleaning.—For reasons just given, there should be no accumulation of dust in any part of the premises. Hygiene, therefore, condemns all carpets and interior finishes which serve as dust and germ traps, such as heavy cornices, elaborate mouldings of door and window frames, wardrobes, cumbersome draperies and unnecessary furniture. Hygiene, on the other hand, approves of neatly polished floors with small rugs, which can be easily taken up and cleaned outside of the house, curves instead of cornices and angles, smooth and non-absorbent walls, instead of embossed wall papers, simplicity of furniture, closets instead of bureaus and wardrobes. In brief, everything which will prevent the collection of dust and germs, and facilitate their removal may be regarded as hygienic. So, for example, a plain, tinted, smooth wall, or the varnished wall papers, which can be cleaned with a damp cloth, or any smooth wall paper guaranteed to be free from arsenic, are in point of health superior to the embossed silk hangings and tapestries of the rich man's home.

The object of house-cleaning is primarily to get rid of the dust and germs. In sweeping it is desirable, therefore, to open the upper windows, but to keep the door leading into the hall closed, so that the dust may not be wafted back into the house. The dusting should always be done with a soft, damp cloth, frequently changed. Under no circumstances should the feather duster be used inside of the house, as it does not remove, but simply displaces the dust. If the cracks in floors have been neatly filled up, and the floors oiled or waxed, they can be cleaned with a damp cloth much more effectively than by the tiresome process of scrubbing, a drudgery to every neat housekeeper.

The kitchen, cooking and eating utensils need special care, as unclean food and utensils are often the cause of cholera-morbus and diarrhœal diseases. Captain Sanderson, in the Cook's Creed, published for the United States Army, in 1862, showed his sanitary acumen when he says: "Better wear out your pans with scouring than your stomachs with purging, and it is less dangerous to work your elbows than your comrades' bowels. Dirt and grease betray the poor cook and destroy the poor soldier."

Every effort should be made to have clean and cool storage facilities for food, and all perishable food, especially milk for infant feeding, should be kept on ice whenever the temperature is above 60 degrees.

Temperature.—The most healthful room temperature in cold weather is between 65 and 70 degrees, as overheated rooms predispose to colds, and should be avoided.

When the house or apartment is heated by cast-iron stoves or other heaters, special care is necessary not to bring them to a red heat, as the very dangerous coal gas is liable to escape through invisible fissures in the plate and joints while the heaters are red hot. It is desirable to select a good-sized heater lined with fire clay, which will not have to be brought to a red heat, and at the same time furnishes sufficient volume of warm air. If the air is superheated, it acquires a peculiar odor, probably due to charring of organic dust; it also becomes very dry and irritating, owing to the rapid evaporation of moisture from the skin and mucous surfaces of the inmates, and in consequence is apt to produce catarrhal affections, conditions which do not prevail when care is taken, and provisions made for the evaporation of a certain amount of water. Coal oil or gas stoves cannot be recommended, unless provisions are made to carry off the products of combustion.

The danger from fire, which is always a great calamity, should be reduced to a minimum by preventing the accumulation of combustible material on the premises, proper care of matches and instruction of the children. Coal oil, gasolene, etc., should never be used for kindling purposes; there is always great danger from explosions, fire, and fatal burns by filling a burning lamp, or extinguishing the wick by blowing over the chimney, or using a lamp when the chimney is broken.

Insects.—Special attention should be paid to the exclusion and destruction of house flies, mosquitoes and other insects, for apart from the discomfort produced, there is much reason for assuming that disease germs may be conveyed by flies and mosquitoes, fleas, bed-bugs and roaches. Celli,[1] of Rome, in 1888, demonstrated that the germs of tuberculosis and other disease germs may retain their vitality after

[1] A. Celli Boll. dell. Loc. Lancis, degli espedali di Roma, 1888.

passing through the intestinal tract of flies. Spillmann[1] pointed out that flies caught while feeding upon the expectoration of a consumptive invariably contained viable germs, and Hoffmann[2] not only confirmed these observations, but also found the germs in the fly spots on the walls of a room occupied by a pthisical subject. The writer has declared it his opinion for years, that flies may carry the germs on their feet, from typhoid stools and infected sources, to the food and milk supply, and in 1895[3] pointed out a number of house infections in this city which could not be explained in any other way. The experience of the Spanish-American war appears to have fully confirmed this conclusion. In like manner, the germs of cholera and of the oriental pest have been disseminated by the house fly.

The evidence that certain species of mosquitoes are the intermediate host of the germs of malaria and yellow fever, and that man may be directly inoculated by the sting of these insects is absolutely conclusive. The efficacy of measures for the extermination of mosquitoes, and their exclusion from houses by proper screening, has been abundantly demonstrated both at home and abroad.

It is gratifying to know, that the mystery of yellow fever was solved by the work of Surgeons Reed, Carroll, Lazear and Agramonte of the United States Army, and Surgeons Gorgas and Keane have demonstrated the best methods for the prevention of yellow fever and malaria by waging an unceasing warfare against the mosquitoes.

Poultry, pigeons and household pets, like dogs, cats and parrots, ought not to be kept in the rooms, as they contaminate the air, harbor insects and may even convey disease germs. Parrots suffer at times from a pulmonary disease, which is transmissable to man, while certain forms of skin disease and itch may be conveyed by dogs and cats.

What has been said of the desirability of general cleanliness applies with equal force to the basement, cellar, attic, yard, outhouses, garbage cans, etc. There should be no accumulation of rubbish within or without the premises. Where no sewer connections exist, the outhouses should be kept in a clean condition, and the seats provided with lids so as to exclude flies. It is also a good plan to disinfect the vault or receptacle with chlorinated lime or fresh whitewash, etc.

A good housewife can not only accomplish a great deal for the health, but also for the comfort and morals of the family. As indicated by our German authors, general order and neatness, clean, white, washable curtains, some potted plants and a few suitable pictures,

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[1]Spillmann and Hanshalter, Comptes rendus 105, p. 352.
[2]Hoffmann Deutsche Med. Zeitung, 1888, No. 57.
[3]Report of the Health Officer, District of Columbia, 1895.

avoiding the loud chromos, and a cheerful and refined atmosphere will do much towards keeping the husband and sons from the saloons.

As a matter of fact, much may be done to transform undesirable living quarters into healthful homes, while filth, neglect and slovenly housekeeping often convert even structurally good houses into veritable hotbeds for disease germs. So, too, persons with delicate constitutions may, by attention to the laws of health, attain to a good old age, while the physical giant by a reckless life soon undermines his general health and goes to a premature grave.

Care of the Skin.—The skin is supplied with a network of blood vessels and nerves, and is a sensory, respiratory, excretory and heat regulating organ. As a sensory organ, it combines with the tactile functions, the power of perceiving impressions of warmth and cold. The respiratory functions of the skin are limited, to be sure; nevertheless, small quantities of oxygen are absorbed and carbonic acid is eliminated. Apart from this, the skin of an average adult eliminates through the sweat glands about 2½ pounds of water a day. Human sweat contains about 2 per cent of solid constituents, mostly in the form of waste matter or impurities, and the odor varies in different regions of the body and in different races. The skin also secretes a fatty substance through the sebaceous glands. As the water from the skin evaporates, the solid matter remains upon the surface, combines with dirt, harbors germs and readily undergoes decomposition, which, apart from the disagreeable odors so characteristic of unclean persons, also tends to mascerate the skin and is liable to produce "galling or chaffing," pimples and boils.

Last, but not least, the accumulation of this matter would naturally close the pores of the perspiratory and sabaceous glands and throw the work of eliminating the impurities upon other organs.

A normal cutaneous function is doubtless of great hygienic importance, as shown by the occurrence of many diseases following its suppression, because in such an event, in addition to the retention of the waste matter in the blood, work is thrown upon the kidneys and other eliminating organs, and these, if already weakened, naturally break down. Since the functions of the skin depend not only upon its anatomical intactness, but also upon cleanliness and a proper tone of the cutaneous vessels and nerves, a rational culture of the skin demands:

1, That it should be freed regularly from the secretory products and particles of dirt; 2, That the cutaneous nerves retain their normal excitability or when impaired that they regain their tone; 3, That we assist the skin in its heat-regulating functions, so that it may not be

overtaxed. All of which may be accomplished by ablutions, baths and suitable clothing.

Ablutions and Baths.—Regular and systematic ablutions with soap and water are requisite for reasons already given, and are especially necessary when engaged in dirty work or exposed to poisonous dust. In addition to the chemical effects of soap, vigorous friction with a brush may be employed, not omitting the finger nails, as disease germs have been found in nail dirt.

The water used should not be too warm for the body, as this would relax the skin and increase the susceptibility to catching cold. If the bathing is not done in the bath tub, it will be well to wash and dry part of the body at a time. In any event the surface should be wiped dry and hard, especially the hair, since wet hair is calculated to produce colds. It is always a good plan to wash the neck and chest with cold water, so as to harden the skin.

We will now briefly refer to the different forms of baths. The cold bath is usually taken in a tub or by means of a shower or needle bath at a temperature of about 65 degrees for adults. It should not last over 3 minutes. Cool baths vary from 65 to 80 degrees. Tepid baths are taken at a temperature of between 80 and 90 degrees, continued from 10 to 15 minutes. Warm baths vary from 90 to 100 degrees, and are generally employed for their cleansing effect. In addition, there are steam or Russian baths, the Turkish or dry hot-air baths, river and ocean baths, swimming pools connected with public baths, medicated baths, etc. Swimming baths are particularly useful, as they also afford an opportunity for muscular exercise, and as the temperature of the water is rarely above 80 degrees. Such baths are both cleansing and stimulating, and therefore an excellent tonic for the skin. All baths should be followed by a cool douche and friction with a rough towel should be employed until the skin is in a general glow. The value of bathing is so fully appreciated that the building regulations of this city compel a bathroom for every apartment offered for rent. No community should fail to make provisions for public baths, both in summer and winter. The beneficial effects upon the health and morals of the least resourceful people cannot be too strongly emphasized. The old Roman baths were prominent features of the daily life of the Romans, and were counted among the choicest privileges. Eleven large and 826 smaller public institutions adorned the ancient capital during the Diocletian period, and the baths of Caracalla, the ruins of which can be seen today, could accommodate 1,600 bathers at one time.

The following sensible rules on the subject of bathing have been issued by the English Humane Society, and are well worth observing

by bathers: "Avoid bathing within two hours after a meal. Avoid bathing when exhausted by fatigue or from any other cause. Avoid bathing when the body is cooling after perspiration. Avoid bathing altogether in the open air, if, after having been a short time in the water, there is a sense of chilliness, with numbness of the hands and feet, but bathe when the body is warm, provided no time is lost in getting into the water. Avoid chilling the body by sitting or standing undressed on the banks or in boats, after having been in the water. Avoid remaining too long in the water, but leave the water immediately if there is the slightest feeling of chilliness. The vigorous and strong may bathe early in the morning on an empty stomach. The young, and those who are weak, had better bathe two or three hours after meals; the best time for such is from two to three hours after breakfast. Those who are subject to giddiness or faintness, or suffer from palpitation or other sense of discomfort at the heart, should not bathe without first consulting their medical adviser."

Clothing.—The object of clothing, apart from the moral and æsthetic aspect, is to aid the skin in its heat-regulating functions. It should, therefore, afford protection against heat and cold, as well as rain and mechanical irritation. Clothing must be adapted to climate and seasons, and extremes should be avoided; as a general rule, warm woolen goods are best suited for winter wear, and cotton or linen for warm weather. It should be understood, however, that flannels absorb more dirt, odors, germs and water than linen or silk, whilst cotton occupies an intermediate position. The question of wet clothing, whether from perspiration or rain, is important, as the drying of clothing on the body involves an expenditure of animal heat, and it is not a matter of indifference whether this takes place rapidly or slowly. It is a fact, that a wet cotton shirt or sweater feels more uncomfortable and colder than a wet woolen garment. The simple reason is that the cotton garment dries more rapidly, but it abstracts during the same time more animal heat than flannels. This fact is not without a practical bearing, as it teaches that persons who perspire easily will do well to wear flannels next to the skin, and this is all the more important when they are liable to draughts or abrupt changes in temperature.

As a protection against *cold,* wool is superior to either cotton or linen, and should be worn for all underclothing. In case of *extreme cold,* besides wool, leather, fur or water-proof clothing, on account of their impermeability to air, are useful. As a protection against *cold winds,* for equal thickness, leather and india-rubber take the first rank, wool the second. As a protection against *rain,* india-rubber or oiled canvas clothing is the best, but it is an exceedingly hot dress, owing

to its impermeability to air, which causes condensation and retention of the perspiration. To overcome this objection, Dumas suggests a material, which is water proof and yet permeable, prepared as follows: The garment is placed in a 7 per cent solution of gelatine, heated to a temperature of 100 degrees F. After immersion for a few minutes it it dried in the air and after drying it is soaked in a ¾ per cent solution of alum and again dried.

As a protection against heat in the shade, the thickness and conducting power of the material are the only factors to be considered. Texture has nothing to do with protection from the direct solar rays; it depends entirely on color, and white is the best. As a protection against fire, leather clothing is generally worn. The fabric can be rendered non-inflammable by the addition of 20 per cent of tungstate of soda and 3 per cent of phosphate of soda to ordinary starch sizing, while cotton or linen goods may be treated simply with starch and borax, in the proportion of a teaspoonful of borax to ½ pint of starch.

Clothing as a Cause of Disease.—Clothing may impair the functions of the body and cause disease: 1, By improper fitting, which leads to compression of blood vessels and nerves and interferes with the normal position of organs and the movements of the body; 2, By improper selection of material affording either insufficient protection or overheating a part or the whole of the body; improper material may also produce irritation or interfere with the ventilation of the skin; 3, By wet clothing, which, in drying, may abstract sufficient animal heat to cause peripheral irritation and reflex internal congestions; 4, By poisonous dyes, such as compounds of arsenic and antimony, chrome yellow, zinc chloride and some of the aniline colors. The toxic symptoms may manifest themselves by general impairment of health or in local affections of the skin; 5, Clothing may harbor disease germs, and a number of instances are on record in which itch, smallpox, tuberculosis and scarlet fever have been spread by second-hand clothing and bedding. This points to the necessity of thorough disinfection.

Special Arrangement of Dress.—The head dress.—As long as the head is covered with hair, the head dress should be permeable and not too warm, lest headache may be induced; on the other hand, insufficient covering may produce neuralgia and rheumatic affections.

The head and eyes should always be protected from the direct rays of the sun, and for this purpose broad-brimmed, dark felt hats for cold weather, and straw or some other light-colored material for summer use are the best.

For the Neck.—Nothing should be worn around the neck which would overheat the parts, dilate the blood vessels and render the skin

sensitive. The collars should be loose fitting, so as not to compress the blood vessels. The neck ought to be bared as much as possible and hardened by frequent ablutions with cold water.

For the Body.—For undergarments, the union suits are the best. They should secure a normal amount of warmth and be so arranged as not to interfere with the free movements of the chest, or compress or displace the abdominal and pelvic organs. For these reasons, corsets and waistbands are wholly inadmissible. Suspenders should be worn by both sexes, or women may wear a bodice arranged for the attachment of skirts, so as to suspend their weight from the shoulders. Steel corset stays and tight lacing cannot be too strongly condemned, because there is ample evidence that they have caused displacement and disease of the abdominal and pelvic organs.

The stockings should be made of some warm, permeable material, such as wool or merino, as the circulation is rather feeble in the lower extremities, and the feet are more liable to perspire. They should be long enough to reach above the knees and there fastened with some loosely-fitting band. Tight elastic bands and other constricting garters are liable to produce varicose veins.

The trousers must be sufficiently loose around the waist and elsewhere to permit of free circulation of blood.

Footwear.—Boots and shoes are intended to protect the feet from the uneven and rough surfaces of the ground, from cold, wet and even heat, and must be constructed so as to meet these requirements. It is needless to insist that they should be patterned after the foot. The sole of a shoe should be so constructed that the great toe touches it in such a way that a line projected posteriorly through the middle of this toe will strike the middle of the heel. The heel should be broad and low, so as not to throw the weight on the toes. Across the tread and toes, the sole should be sufficiently broad to permit of lateral expansion. The uppers should be soft and flexible, but not too roomy, and should fit snugly around the ankles and insteps. Elastic gaiters are preferable to laced shoes.

It is perhaps needless to insist that cleanliness in body and clothing is next to godliness. This may be secured by frequent bathing and change of underwear. It is also a good plan to use night-shirts or pajamas, so as to afford an opportunity for a thorough airing of the underwear worn during the day. If in spite of general cleanliness, there should be indications of excessive sweating and disagreeable odors, especially of the feet, a physician should be consulted.

Bed and Bedding.—Since about one-third of our life is spent in bed, something should be said of this article of comfort and necessity.

As the object of the bed is to promote a refreshing sleep, it should be long and broad enough to permit of the necessary extension of the body; it should be elastic, so as not to compress the soft parts unnecessarily, and it should be warm, but not too warm. Metallic bedsteads are preferable to wood, because less liable to be infected with insects; they should be provided with a woven-wire mattress which admits of free circulation of air. Upon this may be placed a mattress of hair, felt, cotton or excelsior, and pillows preferably made of horse hair. Feather pillows are too heating for the head, unless a layer of paper has been interposed, and high pillows are objectionable, as the position of the sleeper would impede the movement of the diaphragm. Sheets and pillow cases of cotton for winter and of linen for summer are necessary to prevent irritation of the skin and soiling of the mattress, pillows and blankets.

The most suitable coverings for a bed are woolen blankets; they are warm and their permeability admits of the escape of gases. For warm weather a cotton quilt or comforter or even a linen sheet are preferable. The bedding should be aired every morning and exposed, whenever practicable, to sunlight, which is Nature's purifier and destroys all forms of germs.

"Feather beds" and "down quilts" are warmer than blankets, as the air contained in the feathers is a bad conductor of heat, but they are only suitable in very cold climates, or for anæmic and delicate individuals, because they overheat the body, cause dilation of the cutaneous vessels and consequently relax and impair the tone of the skin.

The sleeper should lie with his head slightly raised, preferably with the body inclined to the right side. He should rise rather slowly from the recumbent position, since a sudden change to the erect position, not only accelerates the heart's action, but also changes the blood distribution too abruptly. The bed should be so placed that the occupant is not disturbed by the influence of light. A sound, refreshing sleep can only be had when the senses are no longer stimulated, and light is a stimulus which acts even through the closed eyelids.

Sleep.—We are still in ignorance of the exact nature of sleep or the suspension of automatic activity of the brain. Some authors maintain that it is due to an accumulation of waste products in the blood and central nervous system, and that it ceases with the elimination of these products. Others believe that sleep results from the exhaustion of the supply of intra-molecular oxygen, while still others attribute it to a temporary anæmia of the brain. On the whole, there is much reason for assuming that the refreshing effects of sleep are due to the elimination of waste products from the system and the absorption of a fresh store of oxygen. At all events, Pettenkoffer and Voit found

that of the 954.5 grms. of oxygen absorbed by a healthy adult, in the course of 24 hours, 659.7 grms. are absorbed between 6 o'clock in the evening and 6 o'clock in the morning.

Amount of Sleep Required.—It is well known that healthy, newborn infants sleep all day, except whilst nursing. About the third or fourth week of their life they may remain awake for one-quarter of an hour, in addition to their nursing; in the seventh or eighth week they remain awake one-half hour, and in the fifth month about one hour, but, even when a year old, a child sleeps more than half of the 24 hours. During the second and third year it sleeps from 10 to 12 hours at night and from 2 to 2½ hours in the day time. After the completion of the third year, the necessity for sleep in daytime ceases.

Uffelmann has made a series of careful observations and believes that "healthy, well-cared-for children between 4 and 6 years of age require 11 hours of sleep; at 7 years of age, 10 to 10½ hours of sleep; at 10 years of age, 9½ to 10 hours of sleep; at 12 years of age, 9 hours of sleep; at 14 years of age, 8½ hours of sleep; youths between 16 and 20, 8½ hours of sleep; Adults, 7½ to 8 hours of sleep; while the aged require a larger amount of sleep."

No hard-and-fast lines, however, can be drawn; some children and adults can get along with less, and others require more sleep. On the whole, we may conclude that the average adult requires about 8 hours of sleep, and if the amount is materially lessened languor, pallor, nervous irritability and general peevishness may be observed.

Excessive sleep is harmful, as it tends to produce sluggishness of the bodily functions, especially of the digestive organs. It lessens tissue metamorphosis and favors the deposition of fat—not to mention the bad effects of the prolonged presence in a polluted atmosphere.

We are also beginning to understand that the reason why an excess of sleep instead of being restful to intellectual energy is rather exhaustive is: after a certain amount of sleep, even though the body continues to be somnolent, the mind awakes and, in the midst of the undirected, rapidly-varying mental excursions which follows as much nerve force and mental energy is expended as would be necessary for the more continuous thinking of regular intellectual work.

Irregularity in sleep is always objectionable. The human body resents irregular habits of all kinds. Many infants sicken because of irregular nursing, and we all experience unpleasant symptoms, when from any cause our regular meal hours are interrupted, and it is perfectly natural that such an important organ as the brain should demand regularity in action and rest.

Irregular bed hours are not calculated to promote a sound and refreshing sleep. Since we enjoy the best sleep before midnight, the

hours between 10 o'clock P. M. and 6 A. M. or 11 to 7 A. M. are the most suitable.

Opinions differ as to the admissibility of a nap after dinner, and the question must be decided by individual circumstances. It is quite certain, however, that there is no physiological necessity for such a sleep in healthy children above the age of four, nor for men and women in their best years, unless they have taken an inordinate amount of food. Persons in advanced age may profit by a short rest, which seems often demanded by an overwhelming drowsiness; the same may be said of delicate and anæmic individuals and those suffering from diseases of the digestive system.

Dreams.—In spite of considerable research the occult character of dreams has not been entirely cleared up, although psychologists are agreed that they constitute a manifestation of intellectual life involving the expenditure of a certain amount of brain force or mental energy. Practical experience also teaches that a dreamless sleep is in every way recuperative, while a dreamful night produces a tired feeling in the morning; hence dreams should be avoided, if possible.

There is much reason for believing that the old custom of relating dreams, and the attempt to interpret them, has a bad effect on the minds of all, and especially of children, as it tends to bring about a similar mental rambling during sleep of subsequent nights. Attention has recently been called in an editorial (Journal A. M. A., July 28, 1907), to the fact that children suffer more frequently from night terrors, which are really overvivid dreams, on Sunday and Monday nights. This is partly attributed to the fact that the children have indulged in the "imagination-intoxicating" colored supplement to the Sunday newspaper with its horrors and its dream suggestions. Those of us who have been brought up in rural districts and have listened to dream tales and folk-lore and perused exciting literature have learned that all of this is productive of dreams and night terrors, and should be avoided.

CARE OF SPECIAL ORGANS OR PARTS OF THE BODY.

Importance of Good Teeth.—When we recall the physiology of digestion it is scarcely necessary to point out the importance of a good set of teeth in order to secure thorough mastication and insalivation of the food. The temperature of food and drink exerts a special influence on our teeth. It has been shown that a sudden change from hot to cold in the mouth causes the enamel to crack, and leads to premature decay of the teeth, because the microbes in the mouth will find these fissures a suitable lurking place for their destructive work.

The temperature of food should as nearly as possible approach the normal animal temperature 98.2 degrees, and a temperature of 46 degrees may be regarded as an extreme low temperature and one of 120 degrees as an extreme high temperature for the introduction of food or drinks.[1] The teeth should never be used for the purpose of cracking nuts. Microbes of every description abound in the mouth, and find in the presence of lodged and decaying particles of food a suitable medium for their multiplication. In order to prevent their destructive effects, cleanliness of the mouth is absolutely essential. This can be secured by brushing the teeth with water and castile soap after each meal and before retiring. In case particles of food cannot be thus dislodged, a soft silk thread drawn between the teeth will accomplish the purpose more effectively and wisely than a tooth pick. If the teeth are already painful, or show evidence of decay or of accumulation of tartar, a dentist should be consulted. It is a wise plan to have the teeth examined once a year, and as there are free dental infirmaries, the question of cost should not deter even the least resourceful people.

Habit and Regularity of the Bowels.—As pointed out by Hammond[2] when we perform an act under the operation of certain impressions, there is a tendency towards the performance of a similar act, if like influences are brought to bear upon the organism. "This disposition to repetition prevails in nearly every function of the body and mind until some powerful force intervenes." It is shown by the sensation of hunger and thirst which occur at customary meal hours, the desire to evacuate the bowels at the same hour of the day, the desire for sleep, the hour of awakening and the inexpressible feeling excited by the want of a smoke or a customary stimulant.

Constipation.—When regularity of the bowels is established, the desire to go to the stool returns at the same hour. If this tendency is resisted, it is not long before constipation becomes the rule, with all its attending consequences of ill health. The most natural remedy to correct this morbid habit will be persistent effort to secure an evacuation every day at a fixed hour, aided by the use of succulent vegetables and fruits, and if necessary by small doses of olive oil, cotton-seed oil or Epsom salts and water.

One of the most baneful effects of constipation is hypochondry—a nervous and mental condition brought about by absorption of poisonous products in the intestinal tract, and the continued action of the mind upon some one organ or function supposed to be disordered, nota-

[1]It is believed that this question also plays an important role in the undue prevalence of dyspepsia.

[2]Treatise on Hygiene, Wm. A. Hammond, 1863, p. 122.

bly the heart, liver and stomach. The disease appears most commonly in irritable individuals and in those exhausted from a variety of causes. Such persons are of sound judgment in other respects, but reason erroneously on whatever concerns their own health. In these cases, apart from correcting the digestive derangements, it is often necessary to act upon the mind by keeping it occupied with matters which will divert the thoughts of the patient from himself. This is often readily accomplished on the golf links in persons who require exercise.

Care of the Eyes.—It is well known that exposure of the eyes to the direct rays of the sun may cause inflammation of the retina and even total blindness, and similar effects may be produced by the reflected rays of the sun from mirrors, sheets of water, white walls and snow (snow blindness). On the other hand, defective lighting, as pointed out on page 80, also produces mischief, and must, therefore, be avoided in the home as well as in the shop. Sudden transposition from light to dark, or dark to light, is also injurious and may cause serious diseases of the eyes. Whenever there is any evidence of redness, inflammation, pain, watering or "mattering" of the eyes, a physician should be consulted. While free bathing of the eyes with cold water may exert a preventive and tonic effect, the value of good eysight is too great to trust to domestic remedies, or even to the services of an optician. Whenever there is any difficulty in reading, accompanied by pain or headache, an occulist should be chosen. When we recall the number of accidents which befall the eyes in many occupations, the importance of protective goggles must be apparent.

Ear and Nose.—These organs should be kept clean. There is danger from lodgment of foreign bodies, particularly in children, which may impair the hearing for life, especially when injudicious attempts at removal have been made. In such instances it is always best to consult a competent physician. The chief function of the nose evidently is to arrest more or less of the dust and germs upon its mucous surfaces, and in cold weather to warm the inspired air. Hence, the importance of cleanliness and of breathing through the nose instead of the mouth. In order to do this without discomfort, it is necessary that there be no obstruction in the nasal passages, and persons suffering from catarrh or other symptoms of difficult breathing will do well to undergo treatment. In this connection attention should be called to the advantages of so-called "deep breathing" in the open air or near an open window. This is best accomplished by taking 10 or 12 deep inspirations morning and evening, so as to inflate the lungs to their fullest expansive capacity. This practice is believed to secure a thorough ventilation of all the air vesicles and to increase the power of resistance to the invasion of the tubercle bacillus.

APPENDIX A..

HEALTH OF EMPLOYEES IN THE GOVERNMENT PRINTING OFFICE, WASHINGTON.[1]

By WM. J. MANNING, M. D., Chief of the Sanitary Division, Government Printing Office.

Owing to improved hygienic conditions in modern printing offices, type foundries and stereotype and electrotype foundries, lead poisoning now exists to a very limited extent in these trades.

In the Government Printing Office at Washington, where upward of 4,500 employees are gathered in one building, excellent hygienic conditions prevail. Every ten minutes the air in each room is changed by a very simple device, consisting of air shafts leading from the basement to the roof and which are pierced in such room near the ceiling with suitable openings. A revolving fan placed just below the roof creates a suction, so that a constant supply of fresh air is available at all times, owing to the vacuum thus formed.

The electrotype and stereotype foundries are placed on the topmost floor, the modern, rapidly moving elevators making this practicable, so far as the employees are concerned. At that height from the ground currents of air are constantly in motion, with a consequently greater diffusion of the gases than would prevail on floors nearer the ground. In the large newspaper buildings of the various cities in the United States the same idea is being carried out, these rooms being placed as high in the air as possible.

In the type-founding and stereotyping trades employees whose duties call them to work over the fumes of the melting pots are most exposed to the injurious influences of lead, although the large amount of alloy present tends to lessen the danger.

"Finishers" of the plates, who handle only the smooth, hard, bright slabs of the alloyed metal, which are free from all oxides, run the least risk of lead poisoning. The fact that there is little or no dust, coupled with the fact that the small particles which rub off the plates on the

[1]Dr. Manning's article on Plumbism, which is here reproduced, was submitted by him in competition for a prize offered by the Internationales Arbeitsamt, Basel, Switzerland. The article was purchased for publication by that office on account of merit.

EMERGENCY HOSPITAL, GOVERNMENT PRINTING OFFICE, WASHINGTON, D C.

hands of the workman are in the metallic state and perfectly dry, renders it less liable to be absorbed. In contradistinction to this is the case of the painter. Here the lead, being in the form of a carbonate (white lead) and being mixed with such an excellent absorbing material as oil, is much more rapidly absorbed.

In type foundries practically the same conditions exist as in electrotype foundries. Those who work in the vicinity of the melting pots are much more liable to the toxic vapors which arise from the melting pot. This is particularly the case where the lead is impure and contains volatile substances which, combining with the lead fumes, might possibly add to the toxic influences of the lead. Hence, in "fluxing" the metal, when wax is used as the agent, as little as possible should be used.

Females are, as a rule, employed in this country to sort, finish, and pack the type. Here, as with the "finishers" in the electrotype foundries, the metal is bright and free from oxides, besides being largely alloyed; hence, the chance of absorption with toxic results is greatly lessened. Doctor Osler has pointed out that the ratio of women susceptible to lead poisoning is small as compared with men. Why they are thus immune is hard to say; but, so far as type founding is concerned, probably the above statement indicates the cause.

With the compositor the chances of absorption of lead from the type metal by the skin is probably *nil*. Only a small portion of the epidermis of the fingers (the apex of the thumb and forefinger) is brought in contact with the metal both in "distributing" and in "setting," and the epidermis at these parts is in a more or less thickened, dense condition. Thus, the compositor is protected from absorbing the metal, even when the type is covered with the hydrate which is formed by the long-continued action of air and water. It is well known that substances are absorbed but slightly, if at all, through the skin that is in a thickened condition. If one will stop to consider that the small atoms which become separated from the metal type in one way and another are in a metallic form the chances of absorption are even more remote.

The danger to the compositor, as with the melting-pot tender, would seem to lie in inhalation. With the former the introduction into the system would be by dust, and with the latter in the form of gas.

When foreign bodies are taken into the system in a state of fine subdivision, the favorite seat will be found, as a rule, in the bronchi and the lungs. The process, so far as compositors are concerned, might be termed plumbiosis. The dust which is not carried directly into the alveoli of the lungs by the air breathed finds lodgment on the membrane of the bronchi and the ramifications thereof. That considerable

is carried down the esophagus into the stomach and from there swept out into the intestines is not to be doubted. Might not these fine particles cause the "colic" or active peristalsis by the stimulation of the circular and longitudinal muscular fibers in a mechanical way on the muscles themselves or in a chemic way by a stimulation of the nerves controlling these fibers? This "colic" is one of the first symptoms complained of by the patient.

That the white blood corpuscles play an important part in carrying this finely divided substance throughout the body is also probable, the mode of action being to inclose the fine particles and try to dissolve them, and, failing in that, to transport them to distant points in the body and to the various organs. In that condition known as anthracosis, or coal-miner's consumption, the lung is found to be covered with black dust. The same conditions are found in those suffering from stonecutter's consumption, the lack of carbon rendering the pigment somewhat lighter in color. The condition is known as lithosis. In the knife and saw sharpener's trade the dust is in the form of steel and the consequent disease is known as siderosis. In each case the fine dust finds lodgment in the lungs.

The lungs become so pigmented after long exposure to these conditions, and the alveoli so congested and choked, accompanied by a low form of inflammation that the substances set up, that this, with the unhygienic surroundings and bad ventilation, might explain why so many compositors die each year from tuberculosis. Certainly the tubercle bacilli find a congenial environment in which to begin their fatal work. To the above conditions must be added, of course, the toxic influence of the lead itself, together with the persistent astringent effect of the lead on the air cells. Lead is a very feeble antiseptic and does not seem to inhibit the growth of the bacilli.

The lymph nodes very likely play an important part in carrying the lead through the body to produce plumbism. When lymph nodes become loaded with foreign material of any nature they are apt to break down and the circulation carries the substances to various parts of the body. This would seem to explain the peculiar color of those suffering from plumbism, and it might explain why the kidneys become so irritated and why albumin is found in the urine. Certain tissues seem to have an affinity for the lead thus carried and it is deposited in them. The blue line on the gums which is pathognomic of lead poisoning may be the result of this. It may be that sulphur, which has such a strong affinity for lead and which might be taken into the mouth in articles of food and drink causes this pigmentation. It is strange that the blue line does not make its appearance on any other part of the body.

Certain it is that potassium sulphide when added to a bath will bring out this pigment over the entire body, which remains until the lead in the skin is either eliminated or the affinity is satisfied.

Lead poisoning in the chronic form, as already stated, is very rare among type founders, electrotypers, stereotypers and in the printing trades in this country. It may present itself in the regular type or the symptoms may be hidden. The characteristic symptoms are the blue line on the gums, and the wrist drop, due to the paralysis of the extensors of the forearms. In some cases it first makes its appearance in anæmia and in loss of strength. Anæsthesia may appear in spots on different parts of the body, the spots varying in size from half a dollar to tracts as large as the hand. They may appear on the arms, legs, or on the back. In some cases, however, these symptoms are entirely absent. Albumin may appear in the urine. Doctor Osler describes cases that have come under his care where the symptoms resembled gout and rheumatism. The joints would swell and become very red and tender, the patient suffering all the while intense pain. Doctor Wood mentions cases where the symptoms resembled acute poliomyelitis. In other cases there was simply a failure of health, anæmia, nervous phenomena, etc., the patient having ill-defined, sharp, shooting pains. The pain from the colic seems to merge from the umbilicus in all instances. Arteriosclerosis has been noticed with atrophy of the kidneys and hypertrophy of the heart, the enlargement of the latter organ probably being due to the redoubled effort of the heart to force the blood through the various contracted distal organs. This contraction may be due in a measure to the astringent action of the lead which is noticed upon all tissues when lead is applied in its various forms.

The treatment in these cases may be divided into the preventive and curative, the former relating, of course, only to the trades mentioned in this article. Among the measures which might be taken in the prevention of plumbism in the printing, type founding, and electrotyping and stereotyping trades would be, first of all, the location. The rooms devoted to the melting of type metal should be situated as high as possible in the air and on the topmost floor of the building. The pots should be covered with iron hoods that will cover the entire top of the melting pot proper. The hood should set as near the metal as possible, in such a way that it will not interfere with the manipulation of the ladles or dippers. Hoods with small pipes when used as fume chambers do not answer. It has been found that to be of any service or benefit, the pipe leading from the hood or fume chamber should be nearly as large as the chamber itself and should lead to a smoke chimney or into the outside air. The heat generated should

supply draft enough to carry the fumes off in this way. It might be aided by placing a revolving, circular ventilator in the pipe from the outside and operated by the wind. The whole thing might be made very cheaply of galvanized iron. Various face masks have been suggested, but none seem to be practical, and after they are worn for some time really become a greater danger than if they had not been used, owing to the lack of cleanliness. Cotton and such substances in the nose are useless, because the workman will then breathe through his mouth. The rooms should be at least 10 feet high. Windows should be placed on both sides of the room, so that a current of air may be in constant motion and a fresh supply always on hand. In winter or bad weather a very simple way to obtain fresh air consists in placing a board 3 or 4 inches high lengthwise under the lower window sash. This will enable the fresh air to enter between the lower and upper windows without causing a direct draft on the workmen.

The personal treatment on the part of the workman should be a change of underclothing after work, a bath at least three times a week in hot water with plenty of soap, and at the same time the vigorous application of a flesh brush to the skin. The object here is twofold—to keep the pores free and to remove any particles that may have lodged there, and hence lessen the danger of absorption, while at the same time helping the pores to eliminate that which has been absorbed. The bowels should be kept open by the use of such simple laxatives as sweet oil, castor oil, calomel and soda, etc. An electrotyper who has been in the business for some forty years, and who is now the chief of the largest foundry in the world, informed me that it was his custom to take a teaspoonful of sweet oil every other day and that he had never suffered from any ill effects of plumbism.

So far as compositors are concerned the preventive treatment just described would apply to them. The principal danger here is the bad ventilation, insanitary surroundings, and the dust (principally graphite and minute particles of type metal) which becomes detached by the abrasion of the pieces against each other while being handled. To offset this, "cases" should be blown out by a bellows at least once each week; if possible, in the open air. The bottoms in the different boxes, instead of being flat and square cornered and covered with paper, should be slightly concave at the bottom, with the corners rounded somewhat like a cash till, the idea being to keep the dust from lodging in the corners, where it is difficult to remove even with a bellows. In cases constructed in this manner the dust is, by its own weight, constantly working its way toward the center of each box, where it can easily be removed.

A practical method of removing the caked dust is in vogue in the Government Printing Office at Washington. The type forms after leaving the electrotype foundry are placed on a raised rack which drains into a shallow tank some 6 inches in depth, a pipe connecting this with a sewer. The forms are placed in a horizontal position—that is to say, the side of the chase rests on the rack. Steam under pressure is conducted by a rubber hose and the face of the type is thoroughly "blown," as is the reverse of the form. Later, when the forms are unlocked, the pages are tied up and placed in the "boiling chamber." This chamber consists of a zinc-lined box about 6 feet in length, 4 feet wide, and 4 feet high, a trapdoor opening from the top being the only opening. In the bottom is placed a coil of steam pipe which covers the entire floor of the box, one end of the pipe being left open. The pages of type are placed on shallow perforated trays somewhat like a "galley," each tray fitting in a copper rack, consisting simply of two loops of copper, somewhat like an inverted U with pins attached on which the trays set. Each rack holds eight pages, or a "signature," on the eight trays. After the box is filled, steam is turned on and the type is thoroughly boiled for an hour or more. The cages are lifted in and out by means of hooks. This method not only removes the graphite, but disintegrates the type and "loosens" it, permitting easy distribution. It also leaves the type very clean and aseptic, lessening the chances of infection by the absence of germs. The method of letting cold water run on the forms and thus cleansing them is not so thorough, because the graphite "cakes" and clings to the type and the dust is thrown into the compositor's case with the type, making the cases very dusty and dirty. Each compositor should supply himself with a small brush, suitable for the hands, to be used each time he washes. A private drinking cup is desirable.

In acute cases of lead poisoning the treatment consists in the administration of alkaline carbonates, soap, soluble sulphates, sodium chloride, etc., washing out the stomach with large drafts of water, etc. Alum has been given, and at one time was considered almost a specific. Sweet oil and castor oil will be found useful. Milk should be taken in large quantities. The idea is first to combat the symptoms and then eliminate the lead. Opium can be given for pain. Warm sulphureted baths are very beneficial. They can be made by dissolving 4 ounces of potassium sulphide in 30 gallons of water in a wooden tub. These baths discolor the skin, from the formation of lead sulphide, and should be repeated every few days until this effect ceases. During each bath the patient should be well washed with soap and water to remove discoloration.

The various kinds of typesetting machines all have a melting pot attached to each machine, and where many are in use, unless there is plenty of pure air constantly entering the room and perfect ventilation provided, the fumes from each pot should be conducted by pipes to a chamber in which a vacuum is present, so that the fumes may be instantly removed and carried out into the atmosphere. The virtue of the machine lies in the fact, so far as health is concerned, in the absence of dust, and with the additional advantage on the part of the operator that he does not lay himself open to exposure in handling the metal to so great a degree as in the case of the hand compositor.

There are other alloys that would take the place of lead in type metal, but owing to the excessive cost and high fusing point their use is not practical.

Dr. Manning's Method for the Collection, Cleaning and Disinfection of Spittoons.—From a sanitary point of view the collection, cleaning, and disinfection of the spittoons in the Government Printing Office is a matter of considerable importance. This will be readily understood when it is remembered that there are over 4,500 persons engaged during the 24 hours, all working in eight-hour shifts, and that no fewer than 1,200 cuspidors must be cleaned at the end of each shift.

The method now being installed under Dr. Manning's direction effects this without direct digital contact. It consists in a central sterilizing chamber situated in the basement of the Printing Office, with a cement floor, graded toward the center and made up of two inclines and six shallow gutters, i. e., concavities or semilunar grooves in the cement floor under each iron longitudinal rack extending lengthwise of the room, there being six of such frames or racks, which consist of simply 1-inch angle-iron strips ⅜-inch in thickness, arranged in tiers, 13 inches apart, from which hang suspended at intervals of 9 inches steel-wire spring clutches, secured by a nut and bolt through the eye of clutch and bolted firmly to the underside of angle iron. All edges, angles, corners, and returns of the floor are to be well rounded and the base of each of the four walls are to have 12-inch "sanitary bases" in order that all parts of the room may be self cleansing and draining. The walls of the sterilizing chamber are composed of white, glazed, vitrified brick.

The wire clutch is shaped somewhat liked an inverted letter U, and grasps the cuspidor around the constricted portion or neck when the latter is pressed against the orifice or bell-shaped opening at the bottom of the spring. This spring permits both expansion and contraction around the neck of the cuspidor, and has a sufficient grasp to hold the latter firmly in place while it is subjected to internal and

external washing with a stream of hot water from a hose. After thorough cleansing, the cuspidors are subjected to the action of superheated steam, by which all forms of vegetable and organic life are killed, even the most resistant spore-bearing disease germs.

The cuspidors are collected in the workrooms by a mechanical device or holder so designed as to clutch and "nest" at one time five of the soiled cuspidors, one above the other, and are carried directly, by means of the holder, to specially designed wooden, zinc-lined box trucks with detachable sides. Each truck is capable of holding 175 cuspidors for transmission to the sterilizing chamber. As five soiled cuspidors are taken to the truck they are replaced by five sterilized cuspidors picked up and distributed by the same mechanism, all of which is accomplished by the use of one hand only of the operator.

After the trucks are filled they are transmitted from the respective floors to the basement on a freight elevator and wheeled directly into the sterilizing chamber. Here one of the sides of the box truck is removed, and the operator, by the use of another specially designed forcep, reaches out and grasps the lip of a cuspidor, lifts it free, and with a pronation or twist of the wrist empties the vessel. At the same time, with an upward movement, still grasping the forceps, the constricted part of the cuspidor is brought against the bottom of the wire clutch, which receives and holds it in the manner already described.

When the racks have been thus filled, the operator faces the front of the racks or mouths of the cuspidors and directs a stream of boiling hot water into and against the cuspidors. The same method is pursued from the rear of each respective rack, and thus a large number of cuspidors are quickly cleaned in a thorough and absolutely sanitary manner.

As soon as this operation has been completed, the floor is thoroughly flushed with hot water and all foreign matter is carried by means of two centrally located waste outlets protected by a back-pressure valve into the sewer.

The door of the sterilizing chamber is built on the order of a bulkhead door of a steamer and is closed with a swivel "keeper" and is steam tight.

For economic reasons an exhaust steam pipe is tapped and a branch carried into the top of the sterilizing chamber. This pipe has a number of apertures on the underside and quickly fills the room with steam, coming from above downward.

The sterilization is continued for one hour at a temperature of about 100 degrees centigrade. At the expiration of this period the steam is turned off and the air shaft leading to roof opened for the escape of steam and to aid condensation, thus quickly ridding the room

of all vapor. The door of chamber is then opened, and the operator, after the cuspidors have cooled, plucks them from the rack with his hands and proceeds to place layer after layer in trucks until the latter are full.

When a layer is laid in a truck, he pours in a solution made of bichloride of mercury, 7.3 grains; citric acid, 7.7 grains, to each liter of water, colored with fuchsine to differentiate the solution. This gives a strength, approximately, of 1:2000, sufficient to destroy whatever infectious germs may find their way into the cuspidors through expectoration or otherwise.

The bichloride is used for its germicidal power, while the citric acid is added to retard the coagulation of the albumin in the saliva and expectoration and thus render the action of the bichloride of mercury more potent.

The entire cost of the chemical disinfectants named amounts to less than $12 per annum.

The cuspidors are specially designed to permit of easy cleaning and self-draining largely on account of the character of the curves employed. Angles which would interfere with the cleaning process have been avoided, and the stream of water will readily reach all the internal surfaces. The constriction or neck is sufficiently wide to permit the stream of the hose to enter with full force. A certain amount of constriction at the neck seemed desirable to hide the contents of cuspidor when in use. They were designed, however, with the special object of easy cleaning and without direct digital contact, because it would seem almost inhuman to ask a cleaner to place his hand, containing even a sponge, in the ordinary stock cuspidor and wash the interior in a thorough and sanitary manner. All of this repulsive work has been avoided, so that by the new method the operator does not touch the cuspidor with his hands until he plucks the washed and sterilized cuspidor from the rack and places it in the truck.

Hard vitrified china ware has been used to construct the cuspidors, as this is the only material that will withstand the corrosive action of bichloride of mercury and at the same time present a smooth surface for sanitary cleansing.

Approximately about 3,800 barrels of sawdust are used each year for cuspidors in the Government Printing Office, at a cost of about $100 per month. While, of course, this item will be saved, together with the cost of handling and carting away of the foul and polluted sawdust, the main object has been to reduce to a minimum the danger of infection through tuberculosis sputa among the employees.[1]

[1]All of the mechanical devices used in the above method have been designed by Dr. Manning.

The report of Dr. Manning, in charge of the Sanitary Division of the Government Printing Office, shows that of 4,556 employees in the building from January 1st, 1906, to February 29th, 1908, 1,153 employees received treatment at the Emergency Room, 595 were medical cases inclusive of 9 cases of lead-colic. Of these 516 resumed work, 76 were sent home for treatment and 3 died. Of the 558 surgical cases, 517 resumed work and 41 were sent home for treatment. The Emergency Department is well equipped and the results have in every way justified its establishment.

APPENDIX—REGULATION OF DANGEROUS TRADES IN ENGLAND.

(In addition to the general provisions regarding ventilation, etc., which apply to all manufacturing establishments, the English Factory and Workshop Act (1901) contains a chapter of Special Provisions for dangerous and unhealthy industries, which is reprinted below, together with the Special Rules and Regulations issued by the government officials in accordance with the grant of authority therein made.)

FACTORY AND WORKSHOP ACT, 1901.

PART IV.—DANGEROUS AND UNHEALTHY INDUSTRIES.

(*i*) *Special provisions.*

SECTION 73. (1) Every medical practitioner attending on or called in to visit a patient whom he believes to be suffering from lead, phosphorus, arsenical or mercurial poisoning, or anthrax, contracted in any factory or workshop, shall (unless the notice required by this subsection has been previously sent) send to the chief inspector of factories at the home office, London, a notice stating the name and full postal address of the patient and the disease from which, in the opinion of the medical practitioner, the patient is suffering, and shall be entitled in respect of every notice sent in pursuance of this section to a fee of two shillings and sixpence, to be paid as part of the expenses incurred by the secretary of state in the execution of this act.

(2) If any medical practitioner, when required by this section to send a notice, fails forthwith to send the same, he shall be liable to a fine not exceeding forty shillings.

(3) Written notice of every case of lead, phosphorus, arsenical or mercurial poisoning, or anthrax, occurring in a factory or workshop, shall forthwith be sent to the inspector and to the certifying surgeon for the district; and the provisions of this act with respect to accidents shall apply to any such case in like manner as to any such accident as is mentioned in those provisions.

(4) The secretary of state may, by special order, apply the provisions of this section to any other disease occurring in a factory or workshop, and thereupon this section and the provisions referred to therein shall apply accordingly.

SEC. 74. If in a factory or workshop where grinding, glazing, or polishing on a wheel, or any process is carried on by which dust, or any gas, vapor, or other impurity, is generated and inhaled by the workers to an injurious extent, it appears to an inspector that such inhalation could be to a great extent prevented by the use of a fan or other mechanical means, the inspector may direct that a fan or other mechanical means of a proper construction for preventing such inhalation be provided within a reasonable time, and if the same is not provided, maintained and used, the factory or workshop shall be deemed not to be kept in conformity with this act.

SEC. 75. (1) In every factory or workshop where lead, arsenic or any other poisonous substance is used, suitable washing conveniences must be provided for the use of the persons employed in any department where such substances are used.

(2) In any factory or workshop where lead, arsenic, or other poisonous substance is so used as to give rise to dust or fumes, a person shall not be allowed to take a meal or to remain during the times allowed to him for meals, in any room in which any such substance is used, and suitable provision shall be made for enabling the persons employed in such rooms to take their meals elsewhere in the factory or workshop.

(3) A factory or workshop in which there is a contravention of this section shall be deemed not to be kept in conformity with this act.

SEC. 76. (1) A woman, young person or child must not be employed in any part of a factory in which wet-spinning is carried on, unless sufficient means are employed and continued for protecting the workers from being wetted, and where hot water is used for preventing the escape of steam into the room occupied by the workers.

(2) A factory in which there is a contravention of this section shall be deemed not to be kept in conformity with this act.

SEC. 77. (1) In the part of a factory or workshop in which there is carried on—

(*a*) the process of silvering of mirrors by the mercurial process; or

(*b*) the process of making white lead,

a young person or child must not be employed.

(2) In the part of a factory in which the process of melting or annealing glass is carried on a female, young person, or a child must not be employed.

(3) In a factory or workshop in which there is carried on—

(*a*) the making or finishing of bricks or tiles not being ornamental tiles; or

(*b*) the making or finishing of salt,

a girl under the age of sixteen years must not be employed.

(4) In the part of a factory or workshop in which there is carried on—

(*a*) any dry grinding in the metal trade; or

(*b*) the dipping of lucifer matches,

a child must not be employed.

(5) Notice of a prohibition contained in this section must be affixed in the factory or workshop to which it applies.

SEC. 78. (1) A woman, young person or child must not be allowed to take a meal, or to remain during the time allowed for meals in the following factories or workshops, or parts of factories or workshops; that is to say,—

(*a*) in the case of glass works, in any part in which the materials are mixed; and

(*b*) in the case of glass works where flint glass is made, in any part in which the work of grinding, cutting, or polishing is carried on; and,

(*c*) in the case of lucifer-match works, in any part in which any manufacturing process or handicraft (except that of cutting the wood) is usually carried on; and

(*d*) in the case of earthenware works, in any part known or used as dippers house, dippers drying room, or china scouring room.

(2) If a woman, young person, or child is allowed to take a meal or to remain during the time allowed for meals in a factory or workshop or part thereof in contravention of this section, the woman, young person, or child shall be deemed to be employed contrary to the provisions of this act.

(3) Notice of the prohibition of this section shall be affixed in every factory or workshop to which it applies.

(4) Where it appears [1] to the secretary of state that by reason of the nature of the process in any class of factories or workshops or parts thereof not named in this section the taking of meals therein is specially injurious to health, he may, if he thinks fit, by special order, extend the prohibition in this section to the class of factories or workshops or parts thereof.

(5) If the prohibition in this section is proved to the satisfaction of the secretary of state to be no longer necessary for the protection of the health of women, young persons, and children, in any class of factories or workshops or parts thereof to which it has been so extended, he may, by special order, rescind the order of extension, without prejudice to the subsequent making of another order.

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[1] For orders extending the prohibition in this section, see post.

(ii) Regulations for dangerous trades.

SEC. 79. Where the secretary of state is satisfied that any manufacture, machinery, plant, process, or description of manual labor, used in factories or workshops, is dangerous or injurious to health or dangerous to life or limb, either generally or in the case of women, children, or any other class of persons, he may certify that manufacture, machinery, plant, process, or description of manual labor, to be dangerous; and thereupon the secretary of state may, subject to the provisions of this act, make such regulations as appear to him to be reasonably practicable, and to meet the necessity of the case.

SEC. 80. (1) Before the secretary of state makes any regulations under this act, he shall publish, in such manner as he may think best adapted for informing persons affected, notice of the proposal to make the regulations, and of the place where copies of the draft regulations may be obtained, and of the time (which shall be not less than twenty-one days) within which any objection made with respect to the draft regulations by or on behalf of persons affected must be sent to the secretary of state.

(2) Every objection must be in writing and state—

(*a*) the draft regulations or portions of draft regulations objected to;

(*b*) the specific grounds of objection; and

(*c*) the omissions, additions, or modifications asked for.

(3) The secretary of state shall consider any objection made by or on behalf of any persons appearing to him to be affected which is sent to him within the required time, and he may, if he thinks fit, amend the draft regulations, and shall then cause the amended draft to be dealt with in like manner as an original draft.

(4) Where the secretary of state does not amend or withdraw any draft regulations to which any objection has been made, then (unless the objection either is withdrawn or appears to him to be frivolous) he shall, before making the regulations, direct an inquiry to be held in the manner hereinafter provided.

SEC. 81. (1) The secretary of state may appoint a competent person to hold an inquiry with regard to any draft regulations, and to report to him thereon.

(2) The inquiry shall be held in public, and the chief inspector and any objector and any other person who, in the opinion of the person holding the inquiry, is affected by the draft regulations, may appear at the inquiry either in person or by counsel, solicitor, or agent.

(3) The witnesses on the inquiry may, if the person holding it thinks fit, be examined on oath.

(4) Subject as aforesaid, the inquiry and all proceedings preliminary and incidental thereto shall be conducted in accordance with rules made by the secretary of state.

(5) The fee to be paid to the person holding the inquiry shall be such as the secretary of state may direct and shall be deemed to be part of the expenses of the secretary of state in the execution of this act.

SEC. 82. (1) The regulations made under the foregoing provisions of this act may apply to all the factories and workshops in which the manufacture, machinery, plant, process, or description of manual labor, certified to be dangerous is used (whether existing at the time when the regulations are made or afterwards established) or to any specified class of such factories or workshop. They may provide for the exemption of any specified class or factories or workshops either absolutely or subject to conditions.

(2) The regulations may apply to tenement factories and tenement workshops, and in such case may impose duties on occupiers who do not employ any person, and on owners.

(3) No person shall be precluded by any agreement from doing, or be liable under any agreement to any penalty or forfeiture for doing, such acts as may be necessary in order to comply with the provisions of any regulation made under this act.

SEC. 83. Regulations made under the foregoing provisions of this act may, among other things—

(*a*) prohibit the employment of, or modify or limit the period of employment

of, all persons or any class of persons in any manufacture, machinery, plant, process, or description of manual labor certified to be dangerous; and

(*b*) prohibit, limit, or control the use of any material or process; and

(*c*) modify or extend any special regulations for any class of factories or workshops contained in this act.

SEC. 84. Regulations made under the foregoing provisions of this act shall be laid as soon as possible before both Houses of Parliament, and if either House within the next forty days after the regulations have been laid before the House, resolve, that all or any of the regulations ought to be annulled, the regulations shall, after the date of resolution, be of no effect, without prejudice to the validity of anything done in the meantime thereunder or to the making of any new regulations. If one or more of a set of regulations are annulled, the secretary of state may, if he thinks fit, withdraw the whole set.

SEC. 85. (1) If any occupier, owner, or manager, who is bound to observe any regulation under this act, acts in contravention of or fails to comply with the regulation, he shall be liable for each offense to a fine not exceeding ten pounds [$48.67] and, in the case of a continuing offense, to a fine not exceeding two pounds [$9.73] for every day during which the offense continues after conviction therefor.

(2) If any person other than an occupier, owner, or manager, who is bound to observe any regulation under this act, acts in contravention of, or fails to comply with, the regulation, he shall be liable for each offense to a fine not exceeding two pounds [$9.73] and the occupier of the factory or workshop shall also be liable to a fine not exceeding ten pounds [$48.67], unless he proves that he has taken all reasonable means by publishing, and to the best of his power enforcing, the regulations to prevent the contravention or noncompliance.

SEC. 86. (1) Notice of any regulations having been made under the foregoing provisions of this act, and of the place where copies of them can be purchased, shall be published in the London, Edinburgh, and Dublin Gazettes.

(2) Printed copies of all regulations for the time being in force under this act in any factory or workshop shall be kept posted up in legible characters in conspicuous places in the factory or workshop where they may be conveniently read by the persons employed. In a factory or workshop in Wales or Monmouthshire the regulations shall be posted up in the Welsh language also.

(3) A printed copy of all such regulations shall be given by the occupier to any person affected thereby on his or her application.

(4) If the occupier of any factory or workshop fails to comply with any provision of this section as to posting up or giving copies, he shall be liable to a fine not exceeding ten pounds [$49.67].

(5) Every person who pulls down, injures, or defaces any regulations posted up in pursuance of this act, or any notice posted up in pursuance of the regulations, shall be liable to a fine not exceeding five pounds [$24.33].

(6) Regulations for the time being in force under this act shall be judicially noticed.

SPECIAL RULES AND REGULATIONS.

White lead factories.
Red and orange lead works.
Yellow lead works.
Lead smelting works.
Factories using yellow chromate of lead.
Earthenware and china works.
Electric accumulator factories (regulations).
Iron-plate enameling works (using lead, arsenic, or antimony).
Tinning and enameling works (using lead or arsenic).
Paint and color works (extraction of arsenic).
Brass and compound metal mixing or casting shops.
Chemical works.
Bichromate or chromate of potassium or sodium works.
Explosive works (using di-nitro-benzole).
Vulcanized india-rubber works (using bisulphide of carbon).
Lucifer match factories using white or yellow phosphorus.
Felt hat factories (regulations).

Handling of dry and drysalted hides and skins imported from Asia.
Wool and hair sorting (regulations).
Flax and tow spinning and weaving (regulations).
File cutting by hand (regulations).
Bottling of aerated water.
Spinning by self-acting mules (regulations).
Loading goods on docks and wharves (regulations).
Use of factory engines and cars (regulations).

White Lead Factories.

(Form 247—February, 1903.)

In these rules "person employed in a lead process" means a person who is employed in any work or process involving exposure to white lead, or to lead or lead compounds used in its manufacture, or who is admitted to any room or part of the factory where such process is carried on.

Any approval given by the chief inspector of factories in pursuance of rules 2, 4, 6, 9, or 12 shall be given in writing, and may at any time be revoked by notice in writing signed by him.

Duties of occupiers.

1. On and after July 1st, 1899, no part of a white lead factory shall be constructed, structurally altered, or newly used, for any process in which white lead is manufactured or prepared for sale, unless the plans have previously been submitted to and approved in writing by the chief inspector of factories.

2. (*a*) Every stack shall be provided with a standpipe and movable hose, and an adequate supply of water distributed by a hose.

(*b*) Every white bed shall, on the removal of the covering boards, be effectually damped by the means mentioned above.

Where it is shown to the satisfaction of the chief inspector of factories that there is no available public water service in the district, it shall be a sufficient compliance with this rule if each white bed is, on the removal of the covering boards, effectually damped by means of a watering can.

3. Where white lead is made by the chamber process, the chamber shall be kept moist while the process is in operation, and the corrosions shall be effectually moistened before the chamber is emptied.

4. (*a*) Corrosions shall not be carried except in trays of impervious material.

(*b*) No person shall be allowed to carry on his head or shoulder a tray of corrosions which has been allowed to rest directly upon the corrosions, or upon any surface where there is white lead.

(*c*) All corrosions before being put into the rollers or washbecks, shall be effectually damped, either by dipping the tray containing them in a trough of water or by some other method approved by the chief inspector of factories.

5. The flooring round the rollers shall either be of smooth cement or be covered with sheet lead, and shall be kept constantly moist.

6. On and after January 1st, 1901, except as hereinafter provided—

(*a*) Every stove shall have a window, or windows, with a total area of not not less than 8 square feet, made to open, and so placed as to admit of effectual through ventilation.

(*b*) In no stove shall bowls be placed on a rack which is more than 10 feet from the floor.

(*c*) Each bowl shall rest upon the rack and not upon another bowl.

(*d*) No stove shall be entered for the purpose of drawing until the temperature at a height of 5 feet from the floor has fallen either to 70° F., or to a point not more than 10° F. above the temperature of the air outside.

(*e*) In drawing any stove or part of a stove there shall not be more than one stage or standing place above the level of the floor.

Provided that if the chief inspector approves of any other means of ventilating a stove, as allowing of effectual through ventilation, such means may be adopted, notwithstanding paragraph (*a*) of this rule; and if he approves of any other method of setting and drawing the stoves, as effectually preventing white lead

from falling upon any worker, such method may be followed, notwithstanding paragraphs (*b*) and (*e*) of this rule.

7. No person shall be employed in drawing Dutch stoves on more than two days in any week.

8. No dry white lead shall be deposited in any place that is not provided either with a cover or with a fan effectually removing the dust from the worker.

9. On and after January 1st, 1900, the packing of dry white lead shall be done only under conditions which secure the effectual removal of dust, either by exhaust fans or by other efficient means approved in each case by the chief inspector of factories.

This rule shall not apply where the packing is effected by mechanical means entirely closed in.

10. The floor of any place where packing of dry white lead is carried on shall be of cement, or of stone set in cement.

11. No woman shall be employed or allowed in the white beds, rollers washbecks, or stoves, or in any place where dry white lead is packed, or in other work exposing her to white lead dust.

12. (*a*) A duly qualified medical practitioner (in these rules referred to as the "appointed surgeon") shall be appointed by the occupier for each factory, such appointment to be subject to the approval of the chief inspector.

(*b*) No person shall be employed in a lead process for more than a week without a certificate of fitness granted after examination by the appointed surgeon.

(*c*) Every person employed in a lead process shall be examined once a week by the appointed surgeon, who shall have power to order suspension from employment in any place or process.

(*d*) No person after such suspension shall be employed in a lead process without the written sanction of the appointed surgeon.

(*e*) A register in a form approved by the chief inspector of factories shall be kept, and shall contain a list of all persons employed in lead processes. The appointed surgeon will enter in the register the dates and results of his examinations of the persons employed, and particulars of any directions given by him. The register shall be produced at any time when required by H. M. inspectors of factories or by the certifying surgeon or by the appointed surgeon.

13. Upon any person employed in a lead process complaining of being unwell, the occupier shall, with the least possible delay, give an order upon a duly qualified medical practitioner.

14. The occupier shall provide and maintain sufficient and suitable respirators, overalls, and head-coverings, and shall cause them to be worn as directed in rule 29.

At the end of every day's work they shall be collected and kept in proper custody in a suitable place set apart for the purpose.

They shall be thoroughly washed or renewed every week; and those which have been used in the stoves, and all respirators, shall be washed or renewed daily.

15. The occupier shall provide and maintain a dining-room and a cloakroom in which workers can deposit clothing put off during working hours.

16. No person employed in a lead process shall be allowed to prepare or partake of any food or drink except in the dining-room or kitchen.

17. A supply of a suitable sanitary drink, to be approved by the appointed surgeon shall be kept for the use of the workers.

18. The occupier shall provide and maintain a lavatory for the use of the workers, with soap, nailbrushes, and at least one lavatory basin for every five persons employed. Each such basin shall be fitted with a waste pipe. There shall be a constant supply of hot and cold water laid on, except where there is no available public water service, in which case the provision of hot and cold water shall be such as shall satisfy the inspector in charge of the district.

The lavatory shall be thoroughly cleaned and supplied with clean towels after every meal.

There shall, in addition, be means of washing in close proximity to the workers of each department, if required by notice in writing from the inspector in charge of the district.

There shall be facilities, to the satisfaction of the inspector in charge of the district, for the workers to wash out their mouths.

19. Before each meal, and before the end of the day's work, at least ten minutes in addition to the regular meal times, shall be allowed to each worker for washing.

A notice to this effect shall be affixed in each department.

20. The occupier shall provide and maintain sufficient baths and dressing rooms for all persons employed in lead processes, with hot and cold water, soap and towels, and shall cause each such person to take a bath once a week at the factory.

A bath register shall be kept, containing a list of all persons employed in lead processes, and an entry of the date when each person takes a bath.

This register shall be produced at any time when required by H. M. inspectors of factories or by the certifying surgeon or by the appointed surgeon.

21. The dressing rooms, baths, and water-closets shall be cleaned daily.

22. The floor of each workroom shall be cleaned daily, after being thoroughly damped.

Duties of persons employed.

23. No person shall strip a white bed or empty a chamber without previously effectually damping as directed in Rules 2 and 3.

24. No person shall carry corrosions, or put them into the rollers or washbecks, otherwise than as permitted by Rule 4.

25. No person shall set or draw a stove otherwise than as permitted by Rules 6 and 7.

26. No person shall deposit or pack dry white lead otherwise than as permitted by Rules 8 and 9.

27. Every person employed in a lead process shall present himself at the appointed times for examination by the appointed surgeon, as provided in Rule 12.

28. No person, after suspension by the appointed surgeon, shall work in a lead process without his written sanction.

29. Every person engaged in [stripping] white beds, emptying chambers, rollers, washbecks or grinding, setting or drawing stoves, packing, paint mixing, handling dry white lead, or in any work involving exposure to white-lead dust, shall, while so occupied, wear an overall suit and head covering.

Every person engaged in stripping white beds, or in emptying chambers, or in drawing stoves, or in packing, shall in addition wear a respirator while so occupied.

30. Every person engaged in any place or process named in Rule 29 shall, before partaking of meals or leaving the premises, deposit the overalls, head coverings, and respirators in the place appointed by the occupier for the purpose, and shall thoroughly wash face and hands in the lavatory.

31. Every person employed in a lead process shall take a bath at the factory at least once a week, and wash in the lavatory before bathing; having done so, he shall at once sign his name in the bath register, with the date.

32. No person employed in a lead process shall smoke or use tobacco in any form, or partake of food or drink, elsewhere than in the dining room or kitchen.

33. No person shall in any way interfere, without the knowledge and concurrence of the occupier or manager, with the means and appliances provided for the removal of dust.

34. The foreman shall report to the manager, and the manager shall report to the occupier, any instance coming under his notice of a worker neglecting to observe these rules.

35. No person shadll obtain employment under an assumed name or under any false pretense.

ARTHUR WHITELEGGE,
Chief Inspector of Factories.
M. W. RIDLEY,
One of Her Majesty's Principal Secretaries of State.

1ST JUNE, 1899.

NOTE.—These rules must be kept posted up in conspicuous places in the factory to which they apply, where they may be conveniently read by the persons employed. Any person who is bound to observe these rules and fails to do so, or

acts in contravention of them, is liable to a penalty; and in such cases the occupier also is liable to a penalty unless he proves that he has taken all reasonable means by publishing, and to the best of his power, enforcing the rules, to prevent the contravention or noncompliance. (Factory and Workshop Act, 1901, sections 85 and 86.)

Red and Orange Lead Works.

(Form 261—February, 1904.)

Duties of occupiers.

In drawing charges of massicot, or of red lead, or of orange lead, from the furnace they shall not allow the charges of massicot, or of red lead, or of orange lead, to be discharged on to the floor of the factory or workshop, but shall arrange that it be shoveled, not raked, into wagons.

They shall arrange that no red or orange lead shall be packed in the room or rooms where the manufacture is actually carried on.

They shall arrange that no red or orange lead shall be packed in casks or other receptacles except in a place provided with a hood connected with a fan, or shall provide other suitable means to create an effective draft.

They shall provide sufficient bath accommodation for all persons employed in the manipulation of red and orange lead, and lavatories, with a good supply of hot water, soap, nailbrushes, and towels for the use of such persons.

They shall arrange for a monthly visit by a medical man who shall examine every worker individually, and who shall enter the result of each examination in a register book to be provided by the said occupiers.

They shall provide a sufficient supply of approved sanitary drink for the workers.

Duties of persons employed.

In cases where the cooperation of the workers is required for carrying out the foregoing rules, and where such cooperation is not given, the workers shall be held liable in accordance with the Factory and Workshop Act, 1891, section 9, which runs as follows:

"If any person who is bound to observe any special rules established for any factory or workshop under this act, acts in contravention of, or fails to comply with, any such special rule, he shall be liable on summary conviction to a fine not exceeding two pounds [$9.73]."

Yellow Lead.

(Form 263—February, 1904.)

Duties of occupiers.

They shall provide washing conveniences, with a sufficient supply of hot and cold water, soap, nailbrushes, and towels.

They shall provide respirators and overall suits for the persons employed in all dry processes.

They shall provide fans or other suitable means of ventilation wherever dust is generated in the process of manufacture.

They shall provide a sufficient supply of epsom salts and of an approved sanitary drink.

Duties of persons employed.

In cases where the cooperation of the workers is required for carrying out the foregoing rules and where such cooperation is not given, the workers shall be held liable, in accordance with the Factory and Workshop Act, 1891, section 9, which runs as follows:

"If any person who is bound to observe any special rules established for any

factory or workshop under this act, acts in contravention of, or fails to comply with, any such special rule, he shall be liable on summary conviction to a fine not exceeding two pounds [$9.73]."

Respirators: A good respirator is a cambric bag with or without a thin flexible wire made to fit over the nose.

Sanitary drink suggested: Sulphate of magnesia, 2 ozs.; water, 1 gallon; essence of lemon, sufficient to flavor.

Lead Smelting Works.

(Form 264—January, 1906.)

Duties of occupiers.

They shall provide respirators and overall suits for the use of all persons employed in cleaning the flues, and take means to see that the same are used.

They shall arrange that no person be allowed to remain at work more than two hours at a time in a flue. (A rest of half an hour before reentering will be deemed sufficient.

They shall provide sufficient bath accommodation for all persons employed in cleaning the flues, and every one so employed shall take a bath before leaving the works.

They shall provide washing conveniences, with a sufficient supply of hot and cold water, soap, nailbrushes and towels.

Duties of persons employed.

In cases where the cooperation of the workers is required for carrying out the foregoing rules, and where such cooperation is not given, the workers shall be held liable, in accordance with the Factory and Workshop Act, 1891, section 9, which runs as follows:

"If any person who is bound to observe any special rules established for any factory or workshop under this act, acts in contravention of, or fails to comply with, any such special rule, he shall be liable on summary conviction to a fine not exceeding two pounds [$9.73]."

Special Rules for Factories or Workshops in Which Yellow Chromate of Lead is Used, or in Which Goods Dyed with it Undergo the Processes of Building or Noddling, Winding, Reeling, Weaving or any Other Treatment.

(Form 270—February, 1904.)

Duties of occupiers.

They shall provide washing conveniences, with a sufficient supply of hot and cold water, soap, nailbrushes, and towels.

They shall provide respirators and overall suits for the persons employed in all dry processes.

They shall provide fans and other suitable means of ventilation wherever dust is generated in the process of manufacture.

They shall provide a sufficient supply of epsom salts, and of the sanitary drink mentioned below or some other approved by H. M. inspector of factories.

Respirators: A good respirator is a cambric bag with or without a thin flexible wire made to fit over the nose.

Sanitary drink: Sulphate of magnesia, 2 ozs.; water, 1 gallon; essence of lemon, sufficient to flavor.

Duties of persons employed.

Every person to whom is supplied a respirator or overall suit shall wear the same when at the special work for which such are provided.

Every person shall carefully clean and wash hands and face before meals and before leaving the works.

No food shall be eaten in any part of the works in which yellow chromate of lead is used in the manufacture.

ARTHUR WHITELEGGE,
H. M. Chief Inspector of Factories.

Under section 9, Factory Act, 1891, any person who is bound to observe any special rules is liable to penalties for noncompliance with such special rules.

AMENDED SPECIAL RULES FOR THE MANUFACTURE AND DECORATION OF EARTHENWARE AND CHINA.

As established, after arbitration, by the awards of the umpire, Lord James of Hereford, dated 30th of December, 1901, and 28th of November, 1903.

(Form 923—October, 1905.)

Duties of occupiers.

1. Deleted.

2. After the 1st day of February, 1904, no glaze shall be used which yields to a dilute solution of hydrochloric acid more than five per cent of its dry weight of a soluble lead compound calculated as lead monoxide when determined in the manner described below.

A weighed quantity of dried material is to be continuously shaken for one hour, at the common temperature, with 1,000 times its weight of an aqueous solution of hydrochloric acid containing 0.25 per cent of HCl. This solution is thereafter to be allowed to stand for one hour and to be passed through a filter. The lead salt contained in an aliquot portion of the clear filtrate is then to be precipitated as lead sulphide and weighed as lead sulphate.

If any occupier shall give notice in writing to the inspector for the district that he desires to use glaze which does not conform to the above mentioned conditions, and to adopt in his factory the scheme of compensation prescribed in Schedule B and shall affix and keep the same affixed in his factory, the above provisions shall not apply to his factory but instead thereof the following provisions shall apply.

All persons employed in any process included in Schedule A other than china scouring shall be examined before the commencement of their employment or at the first subsequent visit of the certifying surgeon, and once in each calendar month by the certifying surgeon of the district.

The certifying surgeon may at any time order by signed certificate the suspension of any such person from employment in any process included in Schedule A other than china scouring, if such certifying surgeon is of opinion that such person by continuous work in lead will incur special danger from the effects of plumbism, and no person after such suspension shall be allowed to work in any process included in Schedule A other than china scouring without a certificate of fitness from the certifying surgeon entered in the register.

Any workman who, by reason of his employment being intermittent or casual, or of his being in regular employment for more than one employer, is unable to present himself regularly for examination by the certifying surgeon, may procure himself at his own expense to be examined once a month by a certifying surgeon, and such examination shall be a sufficient compliance with this rule. The results of such examination shall be entered by the certifying surgeon in a book to be kept in the possession of the workman. He shall produce and show the said book to a factory inspector or to any employer on demand, and he shall not make any entry or erasure therein.

If the occupier of any factory to which this rule applies fails duly to observe the conditions of the said scheme, or if any such factory shall by reason of the occurrence of cases of lead poisoning appear to the secretary of state to be in an unsatisfactory condition, he may, after an inquiry, at which the occupier shall have an opportunity of being heard, prohibit the use of lead for such time and subject to such conditions as he may prescribe.

All persons employed in the processes included in Schedule A other than china scouring shall present themselves at the appointed time for examination by the certifying surgeon, as provided in this rule.

In addition to the examinations at the appointed times, any person so employed may at any time present himself to the certifying surgeon for examination, and shall be examined on paying the prescribed fee.

All persons shall obey any directions given by the certifying surgeon.

No person after suspension by the certifying surgeon shall work in any process included in Schedule A other than china scouring without a certificate of fitness from the certifying surgeon entered in the register. Any operative who fails without reasonable cause to attend any monthly examination shall procure himself, at his own expense, to be examined within 14 days thereafter by the certifying surgeon, and shall himself pay the prescribed fee.

A register, in the form which has been prescribed by the secretary of state for use in earthenware and china works, shall be kept, and in it the certifying surgeon shall enter the dates and results of his visits, the number of persons examined and particulars of any directions given by him. This register shall contain a list of all persons employed in the processes included in Schedule A, or in emptying china biscuit ware, and shall be produced at any time when required by His Majesty's inspector of factories or by the certifying surgeon.

3. The occupier shall allow any of His Majesty's inspectors of factories to take at any time sufficient samples for analysis of any material in use or mixed for use.

Provided that the occupier may at the time when the sample is taken, and on providing the necessary appliances, require the inspector to take, seal, and deliver to him a duplicate sample.

But no analytical result shall be disclosed or published in any way except such as shall be necessary to establish a breach of these rules.

4. No woman, young person, or child shall be employed in the mixing of unfritted lead compounds in the preparation or manufacture of fritts, glazes, or colors.

5. No person under 15 years of age shall be employed in any process included in Schedule A, or in emptying china biscuit ware.

Thimble-picking, or threading-up, or looking-over biscuit ware shall not be carried on except in a place sufficiently separated from any process included in Schedule A.

6. All women and young persons employed in any process included in Schedule A shall be examined once in each calendar month by the certifying surgeon for the district.

The certifying surgeon may order by signed certificate in the register the suspension of any such women or young persons from employment in any process included in Schedule A, and no person after such suspension shall be allowed to work in any process included in Schedule A without a certificate of fitness from the certifying surgeon entered in the register.

7. A register, in the form which has been prescribed by the secretary of state for use in earthenware and china works, shall be kept, and in it the certifying surgeon shall enter the dates and results of his visits, the number of persons examined in pursuance of Rule 6 as amended, and particulars of any directions given by him. This register shall contain a list of all persons employed in the processes included in Schedule A, or in emptying china biscuit ware, and shall be produced at any time when required by H. M. inspector of factories or by the certifying surgeon.

8. The occupier shall provide and maintain suitable overalls and head coverings for all women and young persons employed in the processes included in the Schedule A, or in emptying china biscuit ware.

No person shall be allowed to work in any process included in the schedule, or in emptying china biscuit ware, without wearing suitable overalls and head coverings, provided that nothing in this rule shall render it obligatory on any person engaged in drawing glost ovens to wear overalls and head coverings.

All overalls, head coverings, and respirators, when not in use or being washed or repaired, shall be kept by the occupier in proper custody. They shall be washed or renewed at least once a week, and suitable arrangements shall be made by the occupier for carrying out these requirements.

A suitable place, other than that provided for the keeping of overalls, head coverings, and respirators, in which all the above workers can deposit clothing put off during working hours, shall be provided by the occupier.

Each respirator shall bear the distinguishing mark of the worker to whom it is supplied.

9. No person shall be allowed to keep, or prepare, or partake of any food, or drink, or tobacco, or remain during meal times in a place in which is carried on any process included in Schedule A.

The occupier shall make suitable provision to the reasonable satisfaction of the inspector in charge of the district for the accommodation during meal times of persons employed in such places or processes, with a right of appeal to the chief inspector of factories. Such accommodation shall not be provided in any room or rooms in which any process included in Schedule A is carried on, and no washing conveniences mentioned hereafter in Rule 13 shall be maintained in any room or rooms provided for such accommodation.

Suitable provision shall be made for the deposit of food brought by the workers.

10. The processes of the towing of earthenware, china scouring, ground laying, ware cleaning after the dipper, color dusting, whether on-glaze or under-glaze, color blowing, whether on-glaze or under-glaze, glaze blowing, or transfer making, shall not be carried on without the use of exhaust fans, or other efficient means for the effectual removal of dust, to be approved in each particular case by the secretary of state, and under such conditions as he may from time to time prescribe.

In the process of ware cleaning after the dipper, sufficient arrangements shall be made for any glaze scraped off which is not removed by the fan, or the other efficient means, to fall into water.

In the process of ware cleaning of earthenware after the dipper, damp sponges or other damp material shall be provided in addition to the knife or other instrument, and shall be used wherever practicable.

Flat-knocking and fired-flint-sifting shall be carried on only in inclosed receptacles, which shall be connected with an efficient fan or other efficient draught unless so contrived as to prevent effectually the escape of injurious dust.

In all processes the occupier shall, as far as practicable, adopt efficient measures for the removal of dust and for the prevention of any injurious effects arising therefrom.

11. No person shall be employed in the mixing of unfritted lead compounds, in the preparation or manufacture of fritts, glazes or colors containing lead without wearing a suitable and efficient respirator provided and maintained by the employer; unless the mixing is performed in a closed machine or the materials are in such a condition that no dust is produced.

Each respirator shall bear the distinguishing mark of the worker to whom it is supplied.

12. All drying stoves as well as all workshops and all parts of factories shall be effectually ventilated to the reasonable satisfaction of the inspector in charge of the district.

13. The occupier shall provide and continually maintain sufficient and suitable washing conveniences for all persons employed in the processes included in Schedule A, as near as practicable to the places in which such persons are employed.

The washing conveniences shall comprise soap, nailbrushes and towels, and at least one wash-hand basin for every five persons employed as above, with a constant supply of water laid on, with one tap at least for every two basins, and conveniences for emptying the same and running off the waste water on the spot down a waste pipe.

There shall be in front of each washing basin, or convenience, a space for standing room which shall not be less in any direction than 21 inches.

14. The occupier shall see that the floors of workshops and of such stoves as are entered by the work people are sprinkled and swept daily; that all rust, scraps, ashes, and dirt are removed daily, and that the mangles, workbenches, and stairs leading to workshops are cleaned weekly.

When so required by the inspector in charge of the district, by notice in

writing, any such floors, mangles, workbenches, and stairs shall be cleansed in such manner and at such times as may be directed in such notice.

As regards every potters' shop and stove, and every place in which any process included in Schedule A is carried on, the occupier shall cause the sufficient cleansing of floors to be done at a time when no other work is being carried on in such room, and in the case of potters' shops, stoves, dipping houses, and majolica painting rooms, by an adult male.

Provided that in the case of rooms in which ground laying or glost placing is carried on, or in china dippers' drying room, the cleansing prescribed by this rule may be done before work commences for the day, but in no case shall any work be carried on in the room within one hour after any such cleansing as aforesaid has ceased.

15. The occupier shall cause the boards used in the dipping house, dippers' drying room, or glost placing shop to be cleansed every week, and shall not allow them to be used in any other department, except after being cleansed.

When so required by the inspector in charge of the district, by notice in writing, any such boards shall be washed at such times as may be directed in such notice.

Duties of persons employed.

16. All women and young persons employed in the processes included in Schedule A shall present themselves at the appointed time for examination by the certifying surgeon as provided in Rule 6 as amended.

No person after suspension by the certifying surgeon shall work in any process included in the schedule without a certificate of fitness from the certifying surgeon entered in the register.

17. Every person employed in any process included in Schedule A, or in emptying china biscuit ware, shall, when at work, wear a suitable overall and head covering, and also a respirator when so required by Rule 11 as amended, which shall not be worn outside the factory or workshop, and which shall not be removed therefrom except for the purpose of being washed or repaired. Such overall and head covering shall be in proper repair and duly washed.

The hair must be so arranged as to be fully protected from dust by the head covering.

The overalls, head coverings, and respirators when not being worn, and clothing put off during working hours, shall be deposited in the respective places provided by the occupier for such purposes under Rule 8 as amended.

18. No person shall remain during meal times in any place in which is carried on any process included in Schedule A, or introduce, keep, prepare, or partake of any food or drink or tobacco therein at any time.

19. No person shall in any way interfere, without the knowledge and concurrence of the occupier or manager, with the means and appliances provided by the employers for the ventilation of the workshops and stoves, and for the removal of dust.

20. No person included in any process included in Schedule A shall leave the works or partake of meals without previously and carefully cleaning and washing his or her hands.

No person employed shall remove or damage the washing basins or conveniences provided under Rule 13.

20a. The persons appointed by the occupiers shall cleanse the several parts of the factory regularly as prescribed in Rule 14.

Every worker shall so conduct his or her work as to avoid, as far as practicable, making or scattering dust, dirt, or refuse, or causing accumulation of such.

21. The boards used in the dipping house, dippers' drying room, or glost placing shop shall not be used in any other department, except after being cleansed, as directed in Rule 15.

EXEMPTION FOR PROCESSES IN WHICH NO LEAD OR OTHER POISONOUS MATERIAL IS USED.

22. If the occupier of a factory to which these rules apply gives with reference to any process included in Schedule A, other than china scouring, an undertaking

that no lead or lead compound or other poisonous material shall be used, the chief inspector may approve in writing of the suspension of the operation of Rules 4, 5, 6, 7, 8, 15, 16, 17, and 21, or any of them in such process; and thereupon such rules shall be suspended as regards the process named in the chief inspector's approval, and in lieu thereof the following rule shall take effect, viz, No lead or lead compound or other poisonous material shall be used in any process so named.

For the purpose of this rule materials that contain no more than 1 per cent of lead shall be regarded as free from lead.

NOTE.—These rules must be kept posted up in conspicuous places in the factory to which they apply, where they may be conveniently read by persons employed. Any person who is bound to observe these rules and fails to do so, or acts in contravention to them, is liable to a penalty, and in such cases the occupier also is liable to a penalty unless he proves that he has taken all reasonable means, by publishing and to the best of his power enforcing the rules, to prevent the contravention or non-compliance.

SCHEDULE A.

Dipping or other process carried on in the dipping house,
Glaze blowing,
Painting in majolica or other glaze,
Drying after dipping,
Ware cleaning after the application of glaze by dipping or other process,
China scouring,
Glost placing,
Ground laying,
Color dusting } whether on-glaze or under-glaze,
Color blowing }
Lithographic transfer making,
Making or mixing of fritts, glazes, or colors containing lead.

Any other process in which materials containing lead are used or handled in the dry state, or in the form of spray, or in suspension in liquid other than oil or similar medium.

SCHEDULE A.

NOTICE TO WORKMEN EMPLOYED IN PROCESS NAMED IN SCHEDULE A, OTHER THAN CHINA SCOURING.

Conditions of compensation.

1. Where a workman is suspended from working by a certifying surgeon of the district on the ground that he is of opinion that such person by continued work in lead will incur special danger from the effects of plumbism, and the certifying surgeon shall certify that in his opinion he is suffering from plumbism arising out of his employment, he shall, subject as hereinafter mentioned, be entitled to compensation from his employer as hereinafter provided.

(*a*) If any workman who has been suspended as ofersaid dies within nine calendar months from the date of such certificate of suspension, by reason of plumbism contracted before said date, there shall be paid to such of his dependants as are wholly dependent upon his earnings at the time of his death or upon the weekly compensation payable under this scheme, a sum equal to the amount he has earned during a period of three years next preceding the date of the said certificate, such sum not to be more than £300 [$1,459.95] nor less than £150 [$729.98] for an adult male, £100 [$486.65] for an adult female, and £75 [$364.99] for a young person.

(*b*) If the workman does not leave any dependants wholly dependent as aforesaid, but leaves any dependants in part dependent as aforesaid, a reasonable part of that sum.

(*c*) If he leaves no dependants, the reasonable expenses of his medical attendance and burial, not exceeding ten pounds.

2. With respect to such payments the following provisions shall apply—

(*a*) All sums paid to the workmen as compensation since the date of the said certificate shall be deducted from the sums payable to the dependants.

(*b*) The payment shall, in case of death, be made to the legal personal representative of the workingman, or, if he has no legal personal representative, to or for the benefit of his dependants, or, if he leaves no dependants, to the person to whom the expenses are due; and if made to the legal personal representative shall be paid by him to or for the benefit of the dependants or other person entitled thereto.

(*c*) Any question as to who is a dependant, or as to the amount payable to each dependant, shall in default of agreement be settled by arbitration as hereinafter provided in clause 9.

(*d*) The sum allotted as compensation to a dependant may be invested or otherwise applied for the benefit of the person entitled thereto, as agreed, or as ordered by the arbitrator.

(*e*) Any sum which is agreed or is ordered by the arbitrator to be invested may be invested in whole or in part in the post-office savings bank.

3. Where a workman has been suspended and certified as provided in Condition 1, and while he is totally or partially prevented from earning a living by reason of such suspension, he shall be entitled to a weekly payment not exceeding fifty per cent of his average weekly earnings at the time of such suspension, such payment not to exceed £1 [$4.87]. The average may be taken over such period, not exceeding twelve months, as appears fair or reasonable having regard to all the circumstances of the case.

4. In fixing these weekly payments, regard shall be had to the difference between the amount of the average weekly earnings of the workman at the time of his suspension and the average amount, if any, which it is estimated that he will be able to earn afterwards in any occupation or employment, and to any payments (not being wages) which he may have received from the employer in respect of the suspension, and to all the circumstances of the case, including his age and expectation of life.

5. If it shall appear that any workman has persistently disobeyed the special rules or the directions given for his protection by his employers, and that such disobedience has conduced to his suspension, or has not presented himself for examination by the certifying surgeon, or has failed to give full information and assistance as provided in Condition 6, his conduct may be taken into consideration in assessing the amount of the weekly payments.

6. It shall be the duty of every workman at all times to submit to medical examination when required and to give full information to the certifying surgeon and to assist to the best of his power in the obtaining of all facts necessary to enable his physical condition to be ascertained.

7. Any weekly payment may be reviewed at the request either of the employer or of the workman, and on such review may be ended, diminished, or increased, subject to the maximum above provided, and the amount of payment shall, in default of agreement, be settled by arbitration.

8. Any workman receiving weekly payments under this scheme shall submit himself if required for examination by a duly qualified medical practitioner provided and paid by the employer.

If the workman refuses to submit himself to such examination or in any way obstructs the same, his right to such weekly payments shall be suspended until such examination has taken place.

9. If any dispute shall arise as to any certificate of the certifying surgeon or as to the amount of compensation payable as herein provided, or otherwise in relation to these provisions, the same shall be decided by an arbitrator to be appointed by the employer and workman, or in default of agreement by the secretary of state. The said arbitrator shall have all the powers of an arbitrator under the Arbitration Act, and his decision shall be final.

The fee of the arbitrator shall be fixed by the secretary of state, and shall be paid as the arbitrator shall direct.

10. No compensation shall be payable under these provisions unless notice of claim in writing is made within six weeks of the date of the certificate of suspension, or of the death, provided that the want of such notice shall not bar the claim if in the opinion of the arbitrator there was reasonable excuse for the want of it.

A claim for compensation by any workman whose employment is intermittent, or casual, or who is regularly employed by more than one employer, shall only arise against the employers for whom he has worked in a process included in Schedule A within one month prior to his suspension. The said employers shall bear the compensation among them in such proportion as in default of agreement shall be determined by an arbitrator as herein provided.

11. "Employer" includes an occupier, a corporation, and the legal representatives of a deceased employer. "Workman" includes every person, male or female, whether his agreement be one of service or apprenticeship or otherwise, and is expressed or implied, orally, or in writing, and shall include the personal representatives of a deceased workman. "Dependants" has the same meaning as in the Workmen's Compensation Act, 1897.

The terms contained in this notice shall be deemed to be part of the contract of employment of all workmen in the above-named process.

Electric Accumulators.

Whereas the manufacture of electric accumulators has been certified in pursuance of section 79 of the Factory and Workshop Act, 1901, to be dangerous;

I hereby, in pursuance of the powers conferred on me by that act, make the following regulations, and direct that they shall apply to all factories and workshops or parts thereof in which electric accumulators are manufactured.

In these regulations "lead process" means pasting, casting, lead burning, or any work involving contact with dry compounds of lead.

Any approval given by the chief inspector of factories in pursuance of these regulations shall be given in writing, and may at any time be revoked by notice in writing signed by him.

Duties of occupier.

1. Every room in which casting, pasting or lead burning is carried on shall contain at least 500 cubic feet of air space for each person employed therein, and in computing this air space, no height above 14 feet shall be taken into account.

These rooms and that in which the plates are formed, shall be capable of thorough ventilation. They shall be provided with windows made to open.

2. Each of the following processes shall be carried on in such manner and under such conditions as to secure effectual separation from one another and from any other process:—

(*a*) Manipulation of dry compounds of lead;

(*b*) Pasting;

(*c*) Formation, and lead burning necessarily carried on therewith;

(*d*) Melting down of old plates.

Provided that manipulation of dry compounds of lead carried on as in Regulation 5 (*b*) need not be separated from pasting.

3. The floors of the rooms in which manipulation of dry compounds of lead or pasting is carried on shall be of cement or similar impervious material, and shall be kept constantly moist while work is being done.

The floors of these rooms shall be washed with a hose pipe daily.

4. Every melting pot shall be covered with a hood and shaft so arranged as to remove the fumes and hot air from the workrooms.

Lead ashes and old plates shall be kept in receptacles specially provided for the purpose.

5. Manipulation of dry compounds of lead in the mixing of the paste or other processes, shall not be done except (*a*) in any apparatus so closed, or so arranged with an exhaust draft, as to prevent the escape of dust into the workroom; or, (*b*) at a bench provided with (1) efficient exhaust draft and air guide so arranged as to draw the dust away from the worker, and (2) a grating on which each receptacle of the compound of lead in use at the time shall stand.

6. The benches at which pasting is done shall be covered with sheet lead or other impervious material, and shall have raised edges.

7. No woman, young person, or child shall be employed in the manipulation of dry compounds of lead or in pasting.

8. (*a*) A duly qualified medical practitioner (in these regulations referred to as the "appointed surgeon") who may be the certifying surgeon, shall be ap-

pointed by the occupier, such appointment unless held by the certifying surgeon to be subject to the approval of the chief inspector of factories.

(*b*) Every person employed in a lead process shall be examined once a month by the appointed surgeon, who shall have power to suspend from employment in any lead process.

(*c*) No person after such suspension shall be employed in a lead process without written sanction entered in the health register by the appointed surgeon. It shall be sufficient compliance with this regulation for a written certificate to be given by the appointed surgeon and attached to the health register, such certificate to be replaced by a proper entry in the health register at the appointed surgeon's next visit.

(*d*) A health register in a form approved by the chief inspector of factories shall be kept, and shall contain a list of all persons employed in lead processes. The appointed surgeon will enter in the health register the dates and results of his examinations of the persons employed and particulars of any directions given by him. He shall on a prescribed form furnish to the chief inspector of factories on the first day of January in each year a list of the persons suspended by him during the previous year, the cause and duration of such suspension, and the number of examinations made.

The health register shall be produced at any time when required by H. M. inspectors of factories or by the certifying surgeon or by the appointed surgeon.

9. Overalls shall be provided for all persons employed in manipulating dry compounds of lead or in pasting.

The overalls shall be washed or renewed once every week.

10. The occupier shall provide and maintain—

(*a*) A cloakroom in which workers can deposit clothing put off during working hours. Separate and suitable arrangements shall be made for the storage of the overalls required in regulation 9.

(*b*) A dining room unless the factory is closed during meal hours.

11. No person shall be allowed to introduce, keep, prepare, or partake of any food, drink, or tobacco, in any room in which a lead process is carried on. Suitable provision shall be made for the deposit of food brought by the workers.

This regulation shall not apply to any sanitary drink provided by the occupier and approved by the appointed surgeon.

12. The occupier shall provide and maintain for the use of the persons employed in lead processes a lavatory, with soap, nailbrushes, towels, and at least one lavatory basin for every five such persons. Each such basin shall be provided with a waste pipe, or the basins shall be placed on a trough fitted with a waste pipe. There shall be a constant supply of hot and cold water laid onto each basin.

Or, in the place of basins the occupier shall provide and maintain troughs of enamel or similar smooth impervious material, in good repair, of a total length of two feet for every five persons employed, fitted with waste pipes, and without plugs, with a sufficient supply of warm water constantly available.

The lavatory shall be kept thoroughly cleansed and shall be supplied with a sufficient quantity of clean towels once every day.

13. Before each meal and before the end of the day's work, at least ten minutes, in addition to the regular meal times, shall be allowed for washing to each person who has been employed in the manipulation of dry compounds of lead or in pasting.

Provided that if the lavatory accommodation specially reserved for such persons exceeds that required by Regulation 12, the time allowance may be proportionately reduced, and that if there be one basin or two feet of trough for each such person this regulation shall not apply.

14. Sufficient bath accommodation shall be provided for all persons engaged in the manipulation of dry compounds of lead or in pasting, with hot and cold water laid on, and a sufficient supply of soap and towels.

This rule shall not apply if in consideration of the special circumstances of any particular case, the chief inspector of factories approves the use of local public baths when conveniently near, under the conditions (if any) named in such approval.

15. The floors and benches of each workroom shall be thoroughly cleansed daily at a time when no other work is being carried on in the room.

Duties of persons employed.

16. All persons employed in lead processes shall present themselves at the appointed times for examination by the appointed surgeon as provided in Regulation 8.

No person after suspension shall work in a lead process, in any factory or workshop in which electric accumulators are manufactured, without written sanction entered in the health register by the appointed surgeon.

17. Every person employed in the manipulation of dry compounds of lead or in pasting shall wear the overalls provided under Regulation 9. The overalls, when not being worn, and clothing put off during working hours, shall be deposited in the places provided under Regulation 10.

18. No person shall introduce, keep, prepare, or partake of any food, drink (other than any sanitary drink provided by the occupier and approved by the appointed surgeon), or tobacco in any room in which a lead process is carried on.

19. No person employed in a lead process shall leave the premises or partake of meals without previously and carefully cleaning and washing the hands.

20. Every person employed in the manipulation of dry compounds of lead or in pasting shall take a bath at least once a week.

21. No person shall in any way interfere, without the concurrence of the occupier or manager, with the means and appliances provided for the removal of the dust or fumes, and for the carrying out of these regulations.

These regulations shall come into force on the 1st day of January, 1904.

A. AKERS-DOUGLAS,
One of His Majesty's Principal Secretaries of State.

HOME OFFICE, *Whitehall, 21st November, 1903.*

WORKS OF PARTS OF WORKS, IN WHICH LEAD, ARSENIC, OR ANTIMONY IS USED IN THE ENAMELING OF IRON PLATES.

(Form 251—January, 1906.)

Duties of occupiers.

1. They shall provide washing conveniences with a sufficient supply of hot and cold water, soap, nailbrushes, and towels, and take measures to secure that every worker wash face and hands before meals and before leaving the works.

2. They shall provide suitable respirators, overall suits, and head coverings for all workers employed in the processes of grinding, dusting, and brushing.

3. They shall adopt measures on and after the first day of October, 1894, in the dusting and brushing processes for the removal of all superfluous dust, by the use of perforated benches or tables supplied with fans to carry the dust down through the apertures of such benches or tables, the under part of which must be boxed in.

4. They shall provide a sufficient supply of approved sanitary drink, and shall cause the work people to take it.

5. They shall arrange for a medical inspection of all persons employed, at least once a month.

They shall see that no female is employed without previous examination and a certificate of fitness from the medical attendant of the works.

They shall see that no person who has been absent from work through illness shall be reemployed without a medical certificate to the effect that he or she has recovered.

6. Upon any person employed in the works complaining of being unwell, the occupier shall, with the least possible delay, and at his own expense, give an order upon a doctor for professional attendance and medicine. It is to be understood that this rule will not apply to persons suffering from complaints which have not been contracted in the process of manufacture.

7. They shall provide a place or places free from dust and damp in which the operatives can hang up the clothes in which they do not work.

(It is recommended that they shall provide for each female before the day's work begins some light refreshment, such as a half pint of milk and a biscuit.)

Duties of persons employed.

8. Every person to whom is supplied a respirator or overall and head covering shall wear the same when at the work for which such are provided.

9. Every person shall carefully clean and wash hands and face before meals and before leaving the works.

10. No food shall be eaten by any person in any part of the works except in the apartment specially provided for the purpose.

11. No person may seek employment under an assumed name or under any false pretense.

Respirators: A good respirator is a cambric bag with or without a thin flexible wire made to fit over the nose.

Sanitary drink suggested: Sulphate of magnesia, 2 oz.; water, 1 gallon; essence of lemon, sufficient to flavor.

ARTHUR WHITELEGGE,
H. M. Chief Inspector of Factories.

NOTE.—These rules must be kept posted up in conspicuous places in the factory to which they apply, where they may be conveniently read by the persons employed. Any person who is bound to observe these rules and fails to do so or acts in contravention of them, is liable to a penalty; and i nsuch case the occupier also is liable to a penalty unless he proves that he has taken all reasonable means by publishing, and to the best of his power, enforcing the rules, to prevent the contravention or non-compliance.

WORKS IN WHICH LEAD OR ARSENIC IS USED IN THE TINNING AND ENAMELING OF METAL HOLLOW WARE AND COOKING UTENSILS.

(Form 385—March 1906.)

Duties of occupiers.

They shall provide washing conveniences with a sufficient supply of hot and cold water, soap, nailbrushes, and towels, and take measures to secure that every worker wash face and hands before meals and before leaving the works.

They shall see that no food is eaten in any room where the process of tinning or enameling is carried on.

Duties of persons employed.

Every worker shall wash face and hands before meals and before leaving the works.

No worker shall eat food in any room where the process of tinning or enameling is carried on.

ARTHUR WHITELEGGE,
H. M. Chief Inspector of Factories.

NOTE.—These rules must be kept posted up in conspicuous places in the factory to which they apply, where they may be conveniently read by the persons employed. Any person who is bound to observe these rules and fails to do so or acts in contravention of them, is liable to a penalty, and in such case the occupier also is liable to a penalty unless he proves that he has taken all reasonable means by publishing, and to the best of his power, enforcing the rules, to prevent the contravention or non-compliance.

PROCESSES IN THE MANUFACTURE OF PAINTS AND COLORS, AND IN THE EXTRACTION OF ARSENIC.

(Form 249—June, 1904.)

Duties of occupiers.

1. They shall provide washing conveniences, with a sufficient supply of hot and cold water, soap, nailbrushes, and towels, and take measures to secure that

every worker wash face and hands before meals, and before leaving the works; and, in addition to the above, sufficient bath accommodation for the use of all persons employed in the manufacture of milan red, vermilionette, or persian red.

2. They shall provide suitable respirators and overall suits kept in a cleanly state, for all workers engaged in any department where dry white lead or arsenic is used in either the manufacture or paint mixing, and overall suits for those engaged in grinding in water or oil, and for all workers in milan red, vermilionette, or persian red, wherever dust is generated.

3. They shall provide a sufficient supply of approved sanitary drink, which shall be accessible to the workers at all times, and shall cause such approved sanitary drink to be taken daily by workers in any department where white lead or arsenic is used in the manufacture, and shall provide a supply of aperient medicine, which shall be given to the workers, when required, free of charge.

4. No food shall be eaten in any part of the works where white lead or arsenic is used in the manufacture.

Duties of persons employed.

5. Every person to whom is supplied a respirator or overall suit shall wear the same when at the special work for which such are provided.

6. Every person shall carefully clean and wash hands and face before meals and before leaving the works.

7. No food shall be eaten in any part of the works in which white lead or arsenic is used in the manufacture.

8. No person shall smoke or use tobacco in any part of the works in which white lead or arsenic is used in the manufacture.

ARTHUR WHITELEGGE,
H. M. Chief Inspector of Factories.

NOTE.—These rules must be kept posted up in conspicuous places in the works to which they apply, where they may be conveniently read by the persons employed. Any person who is bound to observe these rules and fails to do so or acts in contravention of them, is liable to a penalty; and in such case the occupier also is liable to a penalty unless he proves that he has taken all reasonable means by publishing, and to the best of his power, enforcing the rules, to prevent the contravention or non-compliance.

PROCESSES IN THE MIXING AND CASTING BRASS, GUN METAL, BELL METAL WHITE METAL, DELTA METAL, PHOSPHOR BRONZE, AND MANILLA MIXTURE.

(Form 271—February, 1904.)

Duties of occupiers.

1. They shall provide adequate means for facilitating, as far as possible, the emission or escape from the shop of any noxious fumes or dust arising from the above-named processes. Such means shall include the provision of traps or of louver gratings in the roof or ceiling of any shop in which such processes, or either of them, is or are carried on; or in case of a mixing or casting shop which is situated under any other shop, there shall be provided an adequate flue or shaft (other than any flue or shaft in connection with a furnace or fireplace) to carry any fumes from the mixing or casting shop, by or through any such shop that may be situated above it.

2. They shall cause all such mixing or casting shops, whether defined as factories or as workshops under the Factory and Workshop Act, 1878, to be cleaned down and limewashed once at least within every twelve months, or once within every six months if so required by notice in writing from H. M. inspector of factories and workshops, dating from the time when these were last thus cleaned down and limewashed; and they shall record the dates of such cleaning down and limewashing in a prescribed form of register.

3. They shall provide a sufficient supply of metal basins, water, and soap, for the use of all persons employed in such mixing or casting shops.

4. They shall not employ, or allow within their factory or workshop the em-

ployment of, any woman or female young person, in any process whatever, in any such mixing or casting shop, or in any portion thereof which is not entirely separated by a partition extending from the floor to the ceiling.

Duties of persons employed.

5. They shall not partake of, or cook any food in any such mixing or casting shop within a period of at least ten minutes after the completion of the last pouring of metal in that shop.

ARTHUR WHITELEGGE,
H. M. Chief Inspector of Factories.

July 10, 1896.

Women and young persons under 18 years of age must not be allowed to take a meal in any casting shop or to remain there during the time stated on the notice affixed in the works as being allowed for meals.

These rules must be kept posted up in conspicuous places in the works to which they apply, where they may be conveniently read by the persons employed.

Any person who is bound to observe these rules and fails to do so or acts in contravention of them, is liable to a penalty; and in such case the occupier also is liable to a penalty unless he proves that he has taken all reasonable means, by publishing and to the best of his power enforcing the rules, to prevent the contravention or non-compliance.

CHEMICAL WORKS.

(Form 258—Reprinted December, 1901.)

1. In future every uncovered pot, pan, or other structure containing liquid of a dangerous character, shall be so constructed as to be at least 3 feet in height above the ground or platform. Those already in existence which are less than 3 feet in height, or in cases where it is proved to the satisfaction of an inspector that a height of 3 feet is impracticable, shall be securely fenced.

2. There shall be a clear space around such pots, pans, or other structures, or where any junction exists a barrier shall be so placed as to prevent passage.

3. Caustic pots shall be of such construction that there shall be no footing on the top or sides of the brickwork, and dome-shaped lids shall be used where possible.

4. No unfenced planks or gangways shall be placed across open pots, pans, or other structures containing liquid of a dangerous character. This rule shall not apply to black ash vats where the vats themselves are otherwise securely fastened.

5. Suitable respirators shall be provided for the use of the workers in places where poisonous gases or injurious dust may be inhaled.

6. The lighting of all dangerous places shall be made thoroughly efficient.

7. Every place where caustic soda or caustic potash is manufactured shall be supplied with syringes or wash bottles, which shall be inclosed in covered boxes fixed in convenient places, in the proportion of one to every four caustic pots. They shall be of suitable form and size, and be kept full of clean water. Similar appliances shall be provided wherever, in the opinion of an inspector, they may be desirable.

8. Overalls, kept in a cleanly state, shall be provided for all workers in any room where chlorate of potash or other chlorate is ground. In every such room a bath shall be kept ready for immediate use.

In every chlorate mill, tallow or other suitable lubricant shall be used instead of oil.

9. Respirators charged with moist oxide of iron or other suitable substance, shall be kept in accessible places ready for use in cases of emergency arising from the sulphuretted hydrogen or other poisonous gases.

10. In salt cake departments suitable measures shall be adopted by maintaining a proper draft and by other means to obviate the escape of low-level gases.

11. Weldon bleaching powder chambers, after the free gas has, as far as may be practicable, been drawn off or absorbed by fresh lime, shall, before being

opened, be tested by the standard recognized under the Alkali Act. Such tests shall be duly entered in a register kept for the purpose.

All chambers shall be ventilated as far as possible, when packing is being carried on, by means of open doors on opposite sides and openings in the roof so as to allow of a free current of air.

12. In cases where the cooperation of the workers is required for carrying out the foregoing rules, and where such cooperation is not given, the workers shall be held liable in accordance with the Factory and Workshop Act, 1891, section 9, which runs as follows: "If any person who is bound to observe any special rules, established for any factory or workshop under this Act, acts in contravention of, or fails to comply with, any such special rule, he shall be liable on summary conviction to a fine not exceeding two pounds [$9.73]."

ARTHUR WHITELEGGE,
H. M. Chief Inspector of Factories.

AMENDED SPECIAL RULES FOR CHEMICAL WORKS IN WHICH IS CARRIED ON THE MANUFACTURE OF BICHROMATE OR CHROMATE OF POTASSIUM OR SODIUM.

(Form 260—January, 1906.)

In these rules "persons employed in a chromo process" means a person who is employed in any work involving contact with chromate or bichromate of potassium or sodium, or involving exposure to dust or fumes arising from the manufacture thereof.

Any approval given by the chief inspector in pursuance of Rule 10 shall be given in writing, and may at any time be revoked by notice in writing signed by him.

Duties of occupiers.

1. No uncovered pot, pan, or other structure containing liquid of a dangerous character shall be so constructed as to be less than 3 feet in height above the adjoining ground or platform.

This rule shall not apply to any pot, pan, or other structure constructed before January 1, 1899, or in which a height of 3 feet is impracticable by reason of the nature of the work to be carried on, provided in either case that the structure is securely fenced.

2. There shall be a clear space round all pots, pans, or other structures containing liquid of a dangerous character, except where any junction exists, in which case a barrier shall be so placed as to prevent passage.

3. No unfenced plank or gangway shall be placed across any pot, pan, or other structure containing liquid of a dangerous character.

4. The lighting of all dangerous places shall be made thoroughly efficient.

5. The grinding, separating, and mixing of the raw materials (including chrome ironstone, lime, and sodium and potassium carbonate) shall not be done without such appliances as will prevent, as far as possible, the entrance of dust into the workrooms.

6. "Batches," when withdrawn from the furnaces, shall either be placed in the keaves or vats while still warm, or be allowed to cool in barrows, or other receptacles.

7. Evaporating vessels shall be covered in, and shall be provided with ventilating shafts to carry the steam into the outside air.

8. Packing or crushing of bichromate of potassium or sodium shall not be done except under conditions which secure either the entire absence of dust or its effectual removal by means of a fan.

9. No child or young person shall be employed in a chrome process.

10. The occupier shall, subject to the approval of the chief inspector, appoint a duly qualified medical practitioner (in these rules referred to as the appointed surgeon), who shall examine all persons employed in chrome processes at least once in every month, and shall undertake any necessary medical treatment of disease contracted in consequence of such employment, and shall, after the 30th day of April, 1900, have power to suspend any such person from work in any place or process.

(*b*) No person after such suspension shall be employed in any chrome process without the written sanction of the appointed surgeon.

(*c*) A register shall be kept in a form approved by the chief inspector, and shall contain a list of all persons employed in any chrome process. The appointed surgeon shall enter in the register the dates and results of his examinations of the persons employed and particulars of any treatment prescribed by him. The register shall be produced at any time when required by H. M. inspectors of factories or by the appointed surgeon.

11. Requisites (approved by the appointed surgeon) for treating slight wounds and ulcers shall be kept at hand and be placed in charge of a responsible person.

12. The occupier shall provide sufficient and suitable overall suits for the use of all persons engaged in the processes of grinding the raw materials, and sufficient and suitable overall suits or other adequate means of protection approved in writing by the appointed surgeon, for the use of all persons engaged in the crystal department or in packing.

Respirators approved by the appointed surgeon shall be provided for the use of all persons employed in packing or crushing bichromate of sodium or potassium.

At the end of every day's work they shall be collected and kept in proper custody in a suitable place set apart for the purpose.

The overalls and respirators shall be thoroughly washed or renewed every week.

13. The occupier shall provide and maintain a cloakroom in which workers can deposit clothing put off during working hours.

14. The occupier shall provide and maintain a lavatory for the use of the persons employed in chrome processes; with soap, nailbrushes, and towels, and a constant supply of hot and cold water laid onto each basin. There shall be at least one lavatory basin for every five persons employed in the crystal department and in packing. Each such basin shall be fitted with a waste pipe, or shall be placed in a trough fitted with a waste pipe.

15. The occupier shall provide and maintain sufficient baths and dressing rooms for all persons employed in chrome processes, with hot and cold water laid on, and a sufficient supply of soap and towels; and shall cause each person employed in the crystal department and in packing to take a bath once a week at the factory.

A bath register shall be kept containing a list of all persons employed in the crystal department and in packing, and an entry of the date when each person takes a bath.

The bath register shall be produced at any time when required by H. M. inspectors of factories.

16. The floors, stairs, and landings, shall be cleaned daily.

Duties of persons employed.

17. No person shall deposit a "batch" when withdrawn from the furnace upon the floor nor transfer it to the keaves or vats otherwise than as prescribed in Rule 6.

18. No person shall pack or crush bichromate of potassium or sodium otherwise than as prescribed in Rule 8.

19. (*a*) Every person employed in a chrome process shall present himself at the appointed times for examination by the appointed surgeon as provided in Rule 10.

(*b*) After the 30th day of April, 1900, no person suspended by the appointed surgeon shall work in a chrome process without his written sanction.

20. Every person engaged in the processes of grinding the raw materials shall wear an overall suit, and every person engaged in the crystal department or in packing shall wear an overall suit or other adequate means of protection approved by the appointed surgeon.

Every person employed in packing or crushing bichromate of sodium or potassium shall in addition wear a respirator while so occupied.

21. Every person employed in the processes named in Rule 20 shall before leaving the premises deposit the overalls and respirators in the place appointed by the occupier for the purpose, and shall thoroughly wash face and hands in the lavatory.

22. Every person employed in the crystal department and in packing shall take a bath at the factory at least once a week; and, having done so, shall at once sign his name in the bath register with the date.

23. The foreman shall report to the manager any instance coming under his notice of a workman neglecting to observe these rules.

ARTHUR WHITELEGGE,
Chief Inspector of Factories.
M. W. RIDLEY,
One of Her Majesty's Principal Secretaries of State.

FEBRUARY, 1900.

NOTE.—These rules must be kept posted up in conspicuous places in the factory to which they apply, where they may be conveniently read by the persons employed. Any person who is bound to observe these rules and fails to do so or acts in contravention of them, is liable to penalty; and in such cases the occupier also is liable to a penalty unless he proves that he has taken all reasonable means by publishing, and to the best of his power, enforcing the rules, to prevent the contravention or non-compliance.

MANUFACTURE OF EXPLOSIVES IN WHICH DI-NITRO-BENZOLE IS USED.

(Form 257—December, 1904.)

1. No person to be employed without a medical certificate, stating that he or she is physically fit for such employment.

2. An examination of the workers at their work to be made at least once a fortnight by a certifying surgeon, who shall have power to order temporary suspension or total change of work for any perosn showing symptoms of suffering from the poison, or if after a fair trial he is of opinion that any person is by constitution unfit, he shall direct that such person shall cease to be employed.

3. A supply of fresh milk, and of any drug that the medical officer may consider desirable, shall be kept where the workers in his opinion may require it.

4. No meals to be taken in the work rooms.

5. There shall be provided separate lavatories for men and women, with a good supply of hot water, soap, nailbrushes, and towels, and whenever the skin has come in contact with di-nitro--benzole, the part shall be immediately washed.

6. Overall suits and head coverings shall be supplied to all workers in shops where di-nitro-benzole is used, these suits to be taken off or well brushed before meals and before leaving the works, and to be washed at least once a week.

7. Suitable respirators (capable of being washed), folds of linen, or woolen material of open texture, or other suitable material, shall be supplied to those workers liable to inhale dust, and the wearing of such respirators shall be urged where the workers derive benefit from their use.

8. Where di-nitro-benzole has to be handled, the hands shall always be protected from direct contact with it, either by the use of india-rubber gloves (kept perfectly clean, especially in the inner side), or by means of rags which shall be destroyed immediately after use.

9. Where di-nitro-benzole is broken by hand, the instrument used shall be a wooden bar, spade, or tool with a handle long enough to prevent the worker's face from coming into contact with the material.

10. In all rooms or sheds in which the process, either of purifying, grinding, mixing materials of which di-nitro-benzole forms a part, is carried on, efficient "cowls," ventilating shafts, and mechanical ventilating fans shall be provided to carry off the dust or fumes generated.

11. Drying stoves shall be efficiently ventilated, and, when possible, be charged and drawn at fixed times, and a free current of air shall be admitted for some time prior to the workers entering to draw either a part or the whole of the contents.

12. In the process of filling cartridges, the material shall not be touched by hand, but suitable scoops shall be used, and where patent ventilated cartridge filling machines are not used, there shall be efficient mechanical ventilation arranged in such a manner that the suction shall draw the fumes or dust away from and not across or over the faces of the workers.

13. A register, in a prescribed form, shall be kept, and it shall be the duty of a responsible person named by the firm to enter, at least once a week, a statement that he has personally satisfied himself that each and all of the special rules have been observed, or if not, the reason for such nonobservance. The surgeon to enter in this register the dates of his visits, the results of such visits, and any requirements made by him.

14. The "dipping" rooms to be efficiently ventilated.

ARTHUR WHITELEGGE,
H. M. Chief Inspector of Factories.

NOTE.—These rules must be kept posted up in conspicuous places in the factory to which they apply, where they may be conveniently read by the persons employed. Any person who is bound to observe these rules and fails to do so or acts in contravention of them, is liable to a penalty; and in such case the occupier also is liable to a penalty unless he proves that he has taken all reasonable means by publishing, and to the best of his power, enforcing the rules, to prevent the contravention or noncompliance.

VULCANIZING OF INDIA RUBBER BY MEANS OF BISULPHIDE OF CARBON.

(Form 274—October, 1906.)

I.—Duties of employers.

1. No child or young person shall be employed in any room in which bisulphide of carbon is used.

2. After May 1, 1898, no person shall be employed for more than five hours in any day in a room in which bisulphide of carbon is used, nor for more than two and a half hours at a time without an interval of at least an hour.

3. In vulcanizing waterproof cloth by means of bisulphide of carbon—

(*a*) the trough containing the bisulphide of carbon shall be self-feeding and covered over;

(*b*) the cloth shall be conveyed to and from the drying chamber by means of an automatic machine;

(*c*) no person shall be allowed to enter the drying chamber in the ordinary course of work;

(*d*) the machine shall be covered over and the fumes drawn away from the workers by means of a downward suction fan maintained in constant efficiency.

4. Dipping shall not be done except in boxes so arranged that a suction fan shall draw the fumes away from the workers.

5. No food shall be allowed to be eaten in any room in which bisulphide of carbon is used.

6. A suitable place for meals shall be provided.

7. All persons employed in rooms in which bisulphide of carbon is used shall be examined once a month by the certifying surgeon for the district, who shall, after May 1, 1898, have power to order temporary or total suspension from work.

8. No person shall be employed in any room in which bisulphide of carbon is used contrary to the direction of the certifying surgeon given as above.

9. A register in the form which has been prescribed by the secretary of state for use in india-rubber works shall be kept, and in it the certifying surgeon will enter the dates and result of his visits, with the number of persons examined, and particulars of any directions given by him. This register shall contain a list of all persons employed in rooms in which bisulphide of carbon is used, and shall be produced at any time when required by H. M. inspector of factories or by the certifying surgeon.

II.—Duties of persons employed.

10. No person shall enter the drying room in the ordinary course of work, or perform dipping except in boxes provided with a suction fan carrying the fumes away from the workers.

11. No person shall take any food in any room in which bisulphide of carbon is used.

12. After May 1, 1898, no person shall, contrary to the direction of the certifying surgeon, given in pursuance of Rule 7, work in any room in which bisulphide of carbon is used.

13. All persons employed in rooms in which bisulphide of carbon is used shall present themselves for periodic examination by the certifying surgeon, as provided in Rule 7.

14. It shall be the duty of all persons employed to report immediately to the employer or foreman any defect which they may discover in the working of the fan or in any appliance required by these rules.

ARTHUR WHITELEGGE,
H. M. Chief Inspector of Factories.

NOTE.—These rules are required to be posted up in conspicuous places in the factory or workshop to which they apply, where they may be conveniently read by the persons employed. Any person who willfully injures or defaces them is liabile to a penalty not exceeding five pounds [$24.33]. Occupiers of factories and workshops, and persons employed therein, who are bound to observe these rules, are liable to penalties in case of noncompliance. (Factory and Workshop Act, 1891, section 9, and Factory and Workshop Act, 1901, sections 85 and 86.)

LUCIFER MATCH FACTORIES IN WHICH WHITE OR YELLOW PHOSPHORUS IS USED.

(Form 384—January, 1904.)

In these rules "phosphorous process" means mixing, dipping, drying, boxing, and any other work or process in which white or yellow phosphorus is used; and "person employed in a phosphorous process" means any person who is employed in any room or part of the factory where such a process is carried on.

"Doubled dipped matches" means wood splints, both ends of which have been dipped in the igniting composition.

"Certifying surgeon" means a surgeon appointed under the Factory and Workshop Acts.

Any approval or decision given by the chief inspector of factories in pursuance of these rules shall be given in writing, and may at any time be revoked by notice in writing signed by him.

Rules 5 (*a*), 5 (*b*), 6, 8,and 19, so far as they affect the employment of adult workers, shall not come into force until the 1st day of October, 1900.

Duties of employers.

1. No part of a lucifer match factory shall be constructed, structurally altered or newly used, for the carrying on of any phosphorous process, unless the plans have previously been submitted in duplicate to the chief inspector of factories, and unless he shall have approved the plans in writing, or shall not within six weeks from the submission of the plans have expressed his disapproval in writing of the same.

2. Every room in which mixing, dipping, drying, or boxing is carried on shall be efficiently ventilated by means of sufficient openings to the outer air, and also by means of fans, unless the use of fans is dispensed with by order in writing of the chief inspector; shall contain at least 400 cubic feet of air space for each person employed therein; and in computing this air space no height above 14 feet shall be taken into account; shall be efficiently lighted; shall have a smooth and impervious floor. A floor laid with flagstone or hard bricks in good repair shall be deemed to constitute a smooth and impervious floor.

3. (*a*) The processes of mixing, dipping, and drying shall each be done in a separate and distinct room. The process of boxing double-dipped matches or matches not thoroughly dry shall also be done in a separate and distinct room. These rooms shall not communicate with any other part of the factory unless there shall be a ventilated space intervening; nor shall they communicate with one another, except by means of doorways with closely fitting doors, which doors shall be kept shut except when some person is passing through.

(*b*) Mixing shall not be done except in an apparatus, or so arranged, and ventilated by means of a fan, as to prevent the entrance of fumes into the air of the mixing room.

(*c*) Dipping shall not be done except on a slab provided with an efficient exhaust fan, and with an air inlet between the dipper and the slab, or with a hood, so arranged as to draw the fumes away from the dipper, and to prevent them from entering the air of the dipping room.

(*d*) Matches that have been dipped and can not at once be removed to the drying room shall immediately be placed under a hood provided with an efficient exhaust fan, so arranged as to prevent the fumes from entering the air of the room.

(*e*) Matches shall not be taken to a boxing room not arranged in compliance with subsection (*f*) of this rule until they are thoroughly dry, and matches shall not be taken to a boxing room that is so arranged until they are dried so far as they can be before cutting down and boxing.

(*f*) Cutting down of double-dipped matches and boxing of matches not thoroughly dry shall not be done except at benches or tables provided with an efficient exhaust fan, so arranged as to draw the fumes away from the worker and prevent them from entering the air of the boxing room.

Provided that the foregoing rule shall not prevent the employment of any mechanical arrangement for carrying on any of the above-mentioned processes if the same be approved by the chief inspector as obviating the use of hand labor, and if it be used subject to the conditions (if any) specified in such approval.

Provided further that if the chief inspector shall, on consideration of the special circumstances of any particular case, so approve in writing, all or any of the provisions of the foregoing rule may be suspended for the time named in such approval in writing.

4. Vessels containing phosphorous paste shall, when not actually in use, be kept constantly covered, and closely fitting covers or damp flannels shall be provided for the purpose.

5. (*a*) For the purposes of these rules the occupier shall appoint, subject to the approval of the chief inspector, a duly qualified and registered dentist, herein termed the appointed dentist.

It shall be the duty of the appointed dentist to suspend from employment in any phosphorous process any person whom he finds to incur danger of phosphorous necrosis by reason of defective conditions of teeth or exposure of the jaw.

(*b*) No person shall be newly employed in a dipping room for more than twenty-eight days, whether such days are consecutive or not, without being examined by the appointed dentist.

(*c*) Every person employed in phosphorous process, except persons employed only as boxers of wax vestas or other thoroughly dry matches, shall be examined by the appointed dentist at least once in every three months.

(*d*) Any person employed in the factory complaining of toothache, or a pain or swelling of the jaw, shall at once be examined by the appointed dentist.

(*e*) When the appointed dentist has reason to believe that any person employed in the factory is suffering from inflammation or necrosis of the jaw, or is in such a state of health as to incur danger of phosphorous necrosis, he shall at once direct the attention of the certifying surgeon and occupier to the case. Thereupon such person shall at once be examined by the certifying surgeon.

6. No person shall be employed in a phosphorous process after suspension by the appointed dentist; or after the extraction of a tooth; or after any operation involving exposure of the jaw bone; or after inflammation or necrosis of the jaw; or after examination by the appointed dentist in pursuance of Rule 5 (*d*); or after reference to the certifying surgeon in pursuance of Rule 5 (*e*), unless a certificate of fitness has been given, after examination, by signed entry in the health register, by the appointed dentist or by the certifying surgeon in cases referred to him under Rule 5 (*e*).

7. A health register, in a form approved by the chief inspector of factories, shall be kept by the occupier, and shall contain a complete list of all persons employed in each phosphorous process, specifying with regard to each such person the full name, address, age when first employed, and date of first employment.

The certifying surgeon will enter in the health register the dates and results

of his examinations of persons employed in phosphorous processes, and particulars of any directions given by him.

The appointed dentist will enter in the health register the dates and results of his examinations of the teeth of persons employd in phosphorous processes, and particulars of any directions given by him, and a note of any case referred by him to the certifying surgeon.

The health register shall be produced at any time when required by H. M. inspectors of factories, or by the certifying surgeon, or by the appointed dentist.

8. Except persons whose names are on the health register mentioned in Rule 7, and in respect of whom certificates of fitness shall have been granted, no person shall be newly employed in any phosphorous process for more than 28 days, whether such days are consecutive or not, without a certificate of fitness, granted after examination by the certifying surgeon, by signed entry in the health register.

This rule shall not apply to persons employed only as boxers of wax vestas or other thoroughly dry matches.

9. The occupier shall provide and maintain sufficient and suitable overalls for all persons employed in phosphorous processes, except for persons employed only as boxers of wax vestas or other thoroughly dry matches, and shall cause them to be worn as directed in Rule 20.

At the end of every day's work they shall be collected and kept in proper custody in a suitable place set apart for the purpose.

They shall be thoroughly washed every week, and suitable arrangements for this purpose shall be made by the occupier.

10. The occupier shall provide and maintain—

(*a*) a dining room, and

(*b*) a cloak room in which workers can deposit clothing put off during working hours.

11. No person shall be allowed to prepare or partake of any food or drink in any room in which phosphorous process is carried on, nor to bring any food or drink into such room.

12. The occupier shall provide and maintain for the use of the workers a lavatory, with soap, nailbrushes, towels, and at least one lavatory basin for every five persons employed in any phosphorous process.

Each such basin shall be fitted with a waste pipe. There shall be a constant supply of hot and cold water laid on to each basin.

Or, in the place of basins, the occupier shall provide and maintain enamel or galvanized iron troughs, in good repair, of a total length of 2 feet for every five persons employed, fitted with waste pipes and without plugs, with a sufficient supply of warm water constantly available.

The lavatory shall be kept thoroughly cleansed, and shall be supplied with a sufficient quantity of clean towels twice in each day.

There shall, in addition, be means of washing in close proximity to the workers in any department, if so required in writing by the inspector in charge of the district.

13. The occupier shall provide for the use of every person employed in a phosphorous process an antiseptic mouth wash approved by the appointed dentist, and a sufficient supply of glasses or cups.

14. The floor of each room in which a phosphorous process is carried on shall be cleared of waste at least once a day, and washed at least once a week.

15. A printed copy of these rules shall be given to each person on entering upon employment in a phosphorous process.

Duties of persons employed.

16. No person shall work in a mixing, dipping, drying, or boxing room under other conditions than those prescribed in Rule 3.

17. No person shall allow a vessel containing phosphorous paste to remain uncovered except when actually in use.

18. All persons employed in a phosphorous process shall present themselves at the appointed times for examination by the certifying surgeon and appointed dentist, as provided in Rules 5, 6, and 8.

19. Every person employed in a phosphorous process and suffering from

toothache or swelling of the jaw; or having had a tooth extracted or having undergone any other operation involving exposure of the jaw, shall at once inform the occupier, and shall not resume employment in a phosphorous process without a certificate of fitness from the appointed dentist, as provided in Rule 6.

No person after suspension by the appointed dentist, or after reference to the certifying surgeon, shall resume employment in a phosphorous process without a certificate of fitness, as provided in Rule 6.

20. Every person employed in a phosphorous process for whom the occupier is required by Rule 9 to provide overalls shall wear while at work the overalls so provided.

21. Every person employed in a phosphorous process shall, before partaking of meals or leaving the premises, deposit the overalls in the place appointed by the occupier for the purpose, and shall thoroughly wash in the lavatory.

22. No person shall prepare or partake of food or drink in any room in which a phosphorous process is carried on, or bring any food or drink into such room.

23. No person shall in any way interfere, without the knowledge and concurrence of the occupier or manager, with the means and appliances provided for the removal of dust and fumes.

24. Foremen and forewomen shall report to the manager any instance coming under their notice of a worker neglecting to observe these rules.

ARTHUR WHITELEGGE,
Chief Inspector of Factories.

APRIL, 1900.

NOTE.—These rules must be kept posted up in conspicuous places in the factory to which they apply, where they may be conveniently read by the person employed. Any person who is bound to observe these rules and fails to do so or acts in contravention of them is liable to a penalty; and in such cases the occupier also is liable to a penalty unless he proves that he has taken all reasonable means by publishing, and to the best of his power, enforcing the rules to prevent the contravention or noncompliance.

FELT HATS.

Whereas the manufacture of felt hats with the aid of inflammable solvent has been certified in pursuance of section 79 of the Factory and Workshop Act, 1901, to be dangerous, I hereby, in pursuance of the power conferred on me by that act, make the following regulations, and direct that they shall apply to all factories and workshops in which any inflammable solvent is used in the manufacture of felt hats:

1. Every proofing room and every stove or drying room in which an inflammable solvent is evaporated shall be thoroughly ventilated to the satisfaction of the inspector for the district, so as to carry off as far as possible the inflammable vapor.

2. The number of wet spirit-proofed hat bodies allowed to be in a proofing room at any one time shall not exceed the proportion of one hat for each 15 cubic feet of air space; and in no stove, whilst the first drying of any spirit-proofed hats is being carried on, shall the number of hat bodies of any kind exceed a proportion of one hat for each 12 cubic feet of air space.

A notice stating the dimensions of each such room or stove in cubic feet and the number of spirit-proofed hats allowed to be therein at any one time shall be kept constantly affixed in a conspicuous position.

3. Spirit-proofed hats shall be opened out singly and exposed for one hour before being placed in the stove. This requirement shall not apply in the case of a stove which contains no fire or artificial light capable of igniting inflammable vapor, and which is so constructed and arranged as, in the opinion of the inspector for the district, to present no risk of such ignition from external fire or light.

4. The above rules, in so far as they affect drying stoves, shall not apply to the process of drying hat bodies where the solvent is recovered in a closed oven or chamber fitted with safe and suitable apparatus for the condensation of the solvent.

5. No person shall smoke in any room or place in which inflammable solvent is exposed to the air.

These regulations shall come into force on the 1st day of October, 1902.

A. AKERS-DOUGLAS,
One of His Majesty's Principal Secretaries of State.

WHITEHALL, *12th August*, 1902.

SPECIAL RULES FOR THE HANDLING OF DRY AND DRYSALTED HIDES AND SKINS IMPORTED FROM CHINA OR FROM THE WEST COAST OF INDIA.

(Form 486—February, 1906.)

Duties of occupiers.

1. Proper provision to the reasonable satisfaction of the inspector in charge of the district shall be made for the keeping of the workmen's food and clothing outside any room or shed in which any of the above-described hides or skins are unpacked, sorted, packed, or stored.

2. Proper and sufficient appliances for washing, comprising soap, basins, with water laid on, nailbrushes and towels, shall be provided and maintained for the use of the workmen, to the reasonable satisfaction of the inspector in charge of the district.

3. Sticking plaster, and other requisites for treating scratches and slight wounds shall be kept at hand, available for the use of the persons employed.

4. A copy of the appended notes shall be kept affixed with the rules.

Duties of persons employed.

5. No workman shall keep any food, or any article of clothing other than those he is wearing, in any room or shed in which any of the above-described hides or skins are handled.

He shall not take any food in any such room or shed.

6. Every workman having any open cut or scratch or raw surface, however trifling, upon his face, head, neck, arm, or hand shall immediately report the fact to the foreman, and shall not work on the premises until the wound is healed or is completely covered by a proper dressing after being thoroughly washed.

ARTHUR WHITELEGGE,
Chief Inspector of Factories.
CHAS. T. RITCHIE,
One of His Majesty's Principal Secretaries of State.

AUGUST, 1901.

NOTE 1.—These rules must be kept posted up in conspicuous places in the factory to which they apply, where they may be conveniently read by the persons employed. Any person who is bound to observe these rules and fails to do so, or acts in contravention of them, is liable to a penalty; and in such cases the occupier also is liable to a penalty unless he proves that he has taken all reasonable means by publishing and to the best of his power enforcing the rules, to prevent the contravention or noncompliance.

NOTE 2.—The danger against which these rules are directed is that of anthrax —a fatal disease affecting certain animals, which may be conveyed from them to man by the handling of hides of animals which have died of the disease. The germs of the disease, (anthrax sores) are found in the dust and in the substance of the hide, and may remain active for years. In this country anthrax is rare, and precautions are taken to prevent infected hides from coming into the market, consequently there is little danger in handling the hides of animals slaughtered in the United Kingdom; but in Russia, China, and the East Indies, and in many other parts of the world, the disease is common, and infected hides (which do not differ from others in appearance) are often shipped to British ports. Hence in handling foreign dry hides the above rules should be carefully observed. Wet salted hides are free from dust and less risk is incurred in handling them.

The disease is communicated to man sometimes by breathing or swallowing

the dust from an infected hide, but much more usually by the poison lodging in some point where the skin is broken—such as a fresh scratch or cut or a scratched pimple, or even chapped hands. This happens most readily on the uncovered parts of the body, the hand, arm, face, and most frequently of all on the neck—owing either to an infected hide rubbing against the bare skin, or to dust from such hide alighting on the raw surface. But a raw surface covered by clothing is not free from risk, for dust lodging upon the clothes may sooner or later work its way to the skin beneath. Infection may also be brought about by rubbing or scratching a pimple with hand or nail carrying the anthrax poison.

The first symptoms of anthrax is usually a small inflamed swelling like a pimple or boil, often quite painless, which extends and in a few days becomes black at the center and surrounded by other "pimples." The poison is now liable to be absorbed into the system and will cause risk of life, which can be avoided only by prompt and effective medical treatment in the early stage while the poison is still confined to the pimple. Hence it is of the utmost importance that a doctor should *at once* be consulted if there is any suspicion of infection.

NOTE.—Suitable overalls, protecting the neck and arms, as well as ordinary clothing, add materially to the safety of the workmen, and should be provided and worn, where practicable, if dangerous hides are handled. They should be discarded on cessation of work. Similarly for the protection of the hands, gloves should be provided and worn where the character of the work permits.

WOOL AND HAIR SORTING.

Whereas the processes of sorting, willying, washing, and combing and carding wool, goat-hair, and camel-hair and processes incidental thereto have been certified, in pursuance of section 79 of the Factory and Workshop Act, 1901, to be dangerous:

I hereby in pursuance of the powers conferred on me by that act make the following regulations, and direct that they shall apply to all factories and workshops in which the said processes are carried on, and in which the materials named in the schedules are used.

It shall be the duty of the occupier to comply with Regulations 1 to 16. It shall be the duty of all persons employed to comply with Regulations 17 to 23.

These regulations shall come into force on the 1st of January, 1906, except that Regulations 2 and 8 shall come into force until the 1st of April, 1906.

Definition.

For the purpose of Regulations 2, 3, and 18 opening of wool or hair means the opening of the fleece, including the untying or cutting of the knots, or, if the material is not in fleece, the opening out for looking over or classing purposes.

Duties of occupiers.

1. No bale of wool or hair of the kinds named in the schedules shall be opened for the purpose of being sorted or manufactured, except by men skilled in judging the condition of the material.

No bale of wool or hair of the kinds named in Schedule A shall be opened except after thorough steeping in water.

2. No wool or hair of the kinds named in Schedule B shall be opened except (*a*) after steeping in water, or (*b*) over an efficient opening screen, with mechanical exhaust draft, in a room set apart for the purpose, in which no other work than opening is carried on.

For the purpose of this regulation, no opening screen shall be deemed to be efficient unless it complies with the following conditions:

(*a*) The area of the screen shall in the case of existing screens, be not less than 11 square feet, and in the case of screens hereafter erected be not less than 12 square feet, nor shall its length or breadth be less than 3¼ feet.

(*b*) At no point of the screen within 18 inches from the center shall the velocity of the exhaust draft be less than 100 linear feet per minute.

3. All damaged wool or hair or fallen fleeces or skin wool or hair, if of the

kinds named in the schedules, shall when opened be damped with a disinfectant and washed without being willowed.

4. No wool or hair of the kinds named in schedules B or C shall be sorted except over an efficient sorting board, with mechanical exhaust draft, and in a room set apart for the purpose, in which no work is carried on other than sorting and the packing of the wool or hair therein.

No wool or hair of the kinds numbered (1) and (2) in Schedule A shall be sorted except in the damp state and after being washed.

No damaged wool or hair of the kinds named in schedules shall be sorted except after being washed.

For the purpose of this regulation, no sorting board shall be deemed to be efficient unless it complies with the following conditions:

The sorting board shall comprise a screen of open wirework, and beneath it at all parts a clear space not less than 3 inches in depth. Below the center of the screen there shall be a funnel, measuring not less than 10 inches across the top, leading to an extraction shaft, and the arrangements shall be such that all dust falling through the screen and not carried away by the exhaust can be swept directly into the funnel. The draft shall be maintained in constant efficiency whilst the sorters are at work, and shall be such that not less than 75 cubic feet of air per minute are drawn by the fan from beneath each sorting board.

5. No wool or hair of the kinds named in the schedules shall be willowed except in an efficient willowing machine, in a room set apart for the purpose, in which no work other than willowng s carred on.

For the purpose of this regulation, no willowing machine shall be deemed to be efficient unless it is provided with mechanical exhaust draft so arranged as to draw the dust away from the workmen and prevent it from entering the air of the room.

6. No bale of wool or hair shall be stored in a sorting room; nor any wool or hair except in a space effectually screened off from the sorting room.

No wool or hair shall be stored in a willowing room.

7. In each sorting room, and exclusive of any portion screened off, there shall be allowed an air space of at least 1,000 cubic feet for each person employed therein.

8. In each room in which sorting willowing, or combing is carried on, suitable inlets from the open air, or other suitable source, shall be provided and arranged in such a way that no person employed shall be exposed to a direct draft from any air inlet or to any draft at a temperature of less than 50° F.

The temperature of the room shall not, during working hours, fall below 50° F.

9. All bags in which wool or hair of the kinds named in the schedules has been imported shall be picked clean and not brushed.

10. All pieces of skin, scab, and clippings or shearings shall be removed daily from the sorting room, and shall be disinfected or destroyed.

11. The dust carried by the exhaust draft from opening screens, sorting boards, willowing or other dust extracting machines and shafts shall be discharged into properly constructed receptacles, and not into the open air.

Each extracting shaft and the space beneath the sorting boards and opening screens shall be cleaned out at least once in every week.

The dust collected as above, together with the sweepings from the opening, sorting, and willowing rooms, shall be removed at least twice a week and burned.

The occupier shall provide and maintain suitable overalls and respirators to be worn by the persons engaged in collecting and removing the dust.

Such overalls shall not be taken out of the works or warehouse, either for washing, repairs, or any other purpose, unless they have been steeped overnight in boiling water or a disinfectant.

12. The floor of every room in which opening, sorting, or willowing is carried on shall be thoroughly sprinkled daily with a disinfectant solution after work has ceased for the day, and shall be swept immediately after sprinkling.

13. The walls and ceilings of every room in which opening, sorting, or willowing is carried on shall be limewashed at least once a year, and cleansed at least once within every six months, to date from the time when they were last cleansed.

14. The following requirements shall apply to every room in which unwashed wool or hair of the kinds named in the schedules after being opened for sorting, manufacturing, or washing purposes is handled or stored.

(*a*) Sufficient and suitable washing accommodation shall be provided outside the rooms and maintained for the use of all persons employed in such rooms. The washing conveniences shall comprise soap, nailbrushes, towels, and at least one basin for every five persons employed as above, each basin being fitted with a waste pipe and having a constant supply of water laid on.

(*b*) Suitable places shall be provided outside the rooms in which persons employed in such rooms can deposit food and clothing put off during working hours.

(*c*) No person shall be allowed to prepare or partake of food in any such room.

Suitable and sufficient meal room accommodation shall be provided for workers employed in such rooms.

(*d*) No person having any open cut or sore shall be employed in any such room.

The requirements in paragraph (*c*) shall apply also to every room in which any wool or hair of the kinds named in the schedules is carded or stored.

15. Requisites for treating scratches and slight wounds shall be kept at hand.

16. The occupier shall allow any H. M. inspectors of factories to take at any time, for the purpose of examination, sufficient samples of any wool or hair used on the premises.

Duties of persons employed.

17. No bale of wool or hair of the kinds named in the schedules shall be opened otherwise than as permitted by paragraph 1 of Regulation 1, and no bale of wool or hair of the kinds named in Schedule A shall be opened except after thorough steeping in water.

If on opening a bale any damaged wool or hair of the kinds named in the schedules is discovered, the person opening the bale shall immediately report the discovery to the foreman.

18. No wool or hair of the kinds named in Schedule B shall be opened otherwise than as permitted by Regulation 2.

19. No wool or hair of the kinds named in the schedules shall be sorted otherwise than as permitted by Regulation 4.

20. No wool or hair of the kinds named in the schedules shall be willowed except as permitted by Regulation 5.

21. Every person employed in a room in which unwashed wool or hair of the kinds named in the schedules is stored or handled shall observe the following requirements:

(*a*) He shall wash his hands before partaking of food, or leaving the premises.

(*b*) He shall not deposit in any such room any article of clothing put off during working hours.

He shall wear suitable overalls while at work, and shall remove them before partaking of food or leaving the premises.

(*c*) If he has any open cut or sore, he shall report the fact at once to the foreman, and shall not work in such a room.

No person employed in any such room or in any room in which wool or hair of the kinds named in the schedule is either carded or stored shall prepare or partake of any food therein, or bring any food therein.

22. Persons engaged in collecting or removing dust shall wear the overalls as required by Regulation 11.

Such overalls shall not be taken out of the works or warehouse either for washing, repairs, or any other purpose, unless they have been steeped overnight in boiling water or a disinfectant.

23. If any fan, or any other appliance for the carrying out of these regulations, is out of order, any workman becoming aware of the defect shall immediately report the fact to the foreman.

H. J. GLADSTONE,
One of Her Majesty's Principal Secretaries of State.

HOME OFFICE, *Whitehall, 12th December, 1905.*

Schedule A.

(Wool or hair required to be opened either after steeping or over an efficient opening screen.)

1. Van mohair.
2. Persian locks.
3. Persian or so-called Persian (including Karadi and Bagdad) if not subjected to the process of sorting or willowing.

Schedule B.

(Wool or hair required to be opened either after steeping or over an efficient opening screen.)

Alpaca.
Pelitan.
East Indian cashmere.
Russian camel hair.
Pekin camel hair.
Persian or so-called Persian (including Karadi and Bagdad) if subjected to the process of sorting or willowing.

Schedule C.

(Wool or hair not needing to be opened over an opening screen but required to be sorted over a board provided with downward draught.)

All mohair other than van mohair.

NOTE.—The danger against which these regulations are directed is that of anthrax—a fatal disease affecting certain animals, which may be conveyed from them to man by the handling of wools or hairs from animals which have died of the disease. The germs of the disease (anthrax spores) are found in the dust attaching to the wool, or in the excrement, and in the substance of the pieces of skin, and may remain active for years. In this country and Australia anthrax is rare, consequently there is little danger in handling wools from the sheep of these two countries, but in China, Persia, Turkey, Russia, the East Indies, and in many other parts of the world, the disease is common, and infected fleeces or locks (which may not differ from others in appearance) are often shipped to Great Britain. Hence, in handling foreign dry wools and hair, the above regulations should be carefully observed. Greasy wools are comparatively free from dust and therefore little risk is incurred in handling them. The disease is communicated to man sometimes by breathing or swallowing the dust from these wools or hair, and sometimes by the poison lodging in some point where the skin is broken, such as a fresh scratch or cut, or a scratched pimple, or even chapped hands. This happens more readily on the uncovered parts of the body, the hand, arm, face, and most frequently of all, on the neck, owing either to infected wool rubbing against the bare skin, or to dust from such wool alighting on the raw surface. But a raw surface covered by clothing is not free from risk, for the dust lodging upon the clothes may sooner or later work its way to the skin beneath. Infection may also be brought about by rubbing or scratching a pimple with hand or nail carrying the anthrax poison. Use of the nailbrush, and frequent washing and bathing of the whole body, especially of the arms, neck, and head, will lessen the chance of contracting anthrax.

The first symptom of anthrax is usually a small inflamed swelling like a pimple or boil—often quite painless—which extends, and in a few days becomes black at the center, and surrounded by other "pimples." The poison is now liable to be absorbed into the system, and will cause risk of life, which can be avoided only by prompt and effective medical treatment in the early stage, while the poison is still confined to the pimple. Hence, it is of the utmost importance that a doctor should be *at once* consulted if there is any suspicion of infection.

FLAX AND TOW SPINNING AND WEAVING.

Whereas the processes of spinning and weaving flax and tow and the processes incidental thereto have been certified in pursuance of section 79 of the Factory and Workshop Act, 1901, to be dangerous:

I hereby in pursuance of the powers conferred on me by that act make the following regulations, and direct that they shall apply to all factories in which

the processes named above are carried on, and to all workshops in which the processes of roughing, sorting, or hand-hackling of flax or tow are carried on.

These regulations shall come into force on the 1st day of February, 1907.

Provided that in case of all rooms in which roughing or hand-hackling is now carried on, and in which there is respectively (*a*) no system of local mechanical exhaust ventilation, or (*b*) no artificial means of regulating the temperature, Regulations 2 and 3, respectively, shall not come into force until the 1st day of February, 1908.

Definitions.

In these regulations—

"Degrees" means degrees on the Fahrenheit scale.

"Roughing, sorting, hand-hackling, machine-hackling, carding, and preparing" mean those processes in the manufacture of flax or tow.

It shall be the duty of the occupier to observe Part I of these regulations.

It shall be the duty of all persons employed to observe Part II of these regulations.

PART I.—*Duties of occupiers.*

1. In every room in which persons are employed the arrangements shall be such that during working hours the proportion of carbonic acid in the air of the room shall not exceed 20 volumes per 10,000 volumes of air at any time when gas or oil is used for lighting (or within one hour thereafter) or 12 volumes per 10,000 when electric light is used (or within one hour thereafter) or 9 volumes per 10,000 at any other time.

Provided that it shall be a sufficient compliance with this regulation if the proportion of carbonic acid in the air of the room does not exceed that of the open air outside by more than 5 volumes per 10,000 volumes of air.

2. In every room in which roughing, sorting, or hand-hackling is carried on, and in every room in which machine-hackling, carding or preparing is carried on, and in which dust is generated and inhaled to an extent likely to cause injury to the health of the workers, efficient exhaust and inlet ventilation shall be provided to secure that the dust is drawn away from the workers at, or as near as reasonably possible to, the point at which it is generated.

For the purposes of this regulation the exhaust ventilation in the case of hand-hackling, roughing, or sorting shall not be deemed to be efficient if the exhaust opening at the back of the hackling pins measures less than 4 inches across in any direction, or has a sectional area of less than 50 square inches, or if the linear velocity of the draught passing through it is less than 400 feet per minute at any point within a sectional area of 50 square inches.

3. In every room in which hand-hackling, roughing, sorting, machine-hackling, carding, or preparing is carried on, an accurate thermometer shall be kept affixed; and the arrangements shall be such that the temperature of the room shall not at any time during working hours where hand-hackling roughing, or machine-hackling is carried on, fall below 50 degrees, or where sorting, carding, or preparing is carried on below 55 degrees; and that no person employed shall be exposed to a direct draft from any air inlet, or to any draft at a temperature of less than 50 degrees.

Provided that it shall be a sufficient compliance with this regulation if the heating apparatus be put into operation at the commencement of work, and if the required temperature be maintained after the expiration of one hour from the commencement of work.

4. In every room in which wet spinning is carried on, or in which artificial humidity of air is produced in aid of manufacture, a set of standardized wet and dry bulb thermometers shall be kept affixed in the center of the room or in such other position as may be directed by the insepctor of the district by notice in writing, and shall be maintained in correct working order.

Each of the above thermometers shall be read between 10 and 11 a. m. on every day that any person is employed in the room, and again between 3 and 4 p. m. on every day that any person is employed in the room after 1 p. m., and each reading shall be at once entered on the prescribed form.

The form shall be hung up near the thermometers to which it relates, and shall be forwarded, duly filled in, at the end of each calendar month to the inspector of the district. Provided that this part of this regulation shall not apply to any room in which the difference of reading between the wet and dry bulb thermometers is never less than 4 degrees, if notice of intention to work on that system has been given in the prescribed form to the inspectors for the district, and a copy of the notice is kept affixed in the room to which it applies.

5. The humidity of the atmosphere of any room to which Regulation 4 applies shall not at any time be such that the difference between the readings of the wet and dry bulb thermometers is less than 2 degrees.

6. No water shall be used for producing humidity of the air, or in wet-spinning troughs, which is liable to cause injury to the health of the persons employed or to yield effluvia; and for the purpose of this regulation any water which absorbs from acid solution of permanganate of potash in four hours at 60 degrees more than 0.5 grain of oxygen per gallon of water, shall be deemed to be liable to cause injury to the health of the persons employed.

7. Efficient means shall be adopted to prevent the escape of steam from wet-spinning troughs.

8. The pipes used for the introduction of steam into any room in which the temperature exceeds 70 degrees or for heating the water in any wet-spinning trough, shall, so far as they are within the room and not covered by water, be as small in diameter and as limited in length as is reasonably practicable, and shall be effectively covered with nonconducting material.

9. Efficient splash guards shall be provided and maintained on all wet-spinning frames of 2¾ inch pitch and over, and on all other wet-spinning frames unless waterproof skirts, and bibs of suitable material are provided by the occupier and worn by the workers.

Provided that if the chief inspector is satisfied with regard to premises in use prior to 30th June, 1905, that the structural conditions are such that splash guards can not conveniently be used, he may suspend the requirements as to splash guards. Such suspension shall only be allowed by certificate in writing, signed by the chief inspector, and shall be subject to such conditions as may be stated in the certificate.

10. The floor of every wet-spinning room shall be kept in sound condition, and drained so as to prevent retention or accumulation of water.

11. There shall be provided for all persons employed in any room in which wet-spinning is carried on, or in which artificial humidity of air is produced in air of manufacture, suitable and convenient accommodation in which to keep the clothing taken off before starting work, and in the case of building erected after 30th June, 1905, in which the difference between the readings of the wet and dry bulb thermometers is at any time less than 4 degrees, such accommodation shall be provided in cloak-rooms ventilated and kept at a suitable temperature and situated in or near the workrooms in question.

12. Suitable and efficient respirators shall be provided for the use of the persons employed in machine-hackling, preparing, and carding.

Part II.—*Duties of persons employed.*

13. All persons employed on wet-spinning frames without efficient splash guards shall wear the skirts and bibs provided by the occupier in pursuance of Regulation 9.

14. No person shall in any way interfere, without the concurrence of the occupier or manager, with the means and appliances provided for ventilation, or for the removal of dust, or for the other purposes of these regulations.

H. J. Gladstone,
One of His Majesty's Principal Secretaries of State.

Home Office, *Whitehall, 20th February, 1906.*

File Cutting by Hand.

Whereas the process of file cutting by hand has been certified in pursuance of section 79 of the Factory and Workshop Act, 1901, to be dangerous:

I hereby, in pursuance of the powers conferred on me by that act, make the

following regulations, and direct that they shall apply to all factories and workshops (including tenement factories and tenement workshops) or parts thereof in which the process of file cutting by hand is carried on: Provided that the chief inspector of factories may by certificate in writing exempt from all or any of these regulations any factory or workshop in which he is satisfied that the beds used are of such composition as not to entail danger to the health of the persons employed.

1. The number of stocks in any room shall not be more than one stock for every 350 cubic feet of air space in the room; and in calculating air space for the purpose of this regulation any space more than 10 feet above the floor of the room shall not be reckoned.

2. After the 1st day of January, 1904, the distance between the stocks measured from the center of one stock to the center of the next shall not be less than 2 feet 6 inches, and after the 1st day of January, 1905, the said distance shall not be less than 3 feet.

3. Every room shall have a substantial floor, the whole of which shall be covered with a washable material, save that it shall be optional to leave a space not exceeding 6 inches in width round the base of each stock.

The floor of every room shall be kept in good repair.

4. Efficient inlet and outlet ventilators shall be provided in every room. The inlet ventilators shall be so arranged and placed as not to cause a direct draft of incoming air to fall on the workmen employed at the stocks.

The ventilators shall be kept in good repair and in working order.

5. No person shall interfere with or impede the working of the ventilators.

6. Sufficient and suitable washing conveniences shall be provided and maintained for the use of the file cutters. The washing conveniences shall be under cover and shall comprise at least one fixed basin for every ten or less stocks. Every basin shall be fitted with a waste pipe discharging over a drain or into some receptacle of a capacity at least equal to one gallon for every file cutter using the basin. Water shall be laid on to every basin either from the main or from a tank of a capacity of not less than 1½ gallons to every worker supplied from such tank. A supply of clean water shall be kept in the said tank while work is going on at least sufficient to enable every worker supplied from such tank to wash.

7. The walls and ceiling of every room, except such parts as are painted or varnished or made of glazed brick, shall be limewashed once in every six months ending the 30th of June and once in every six months ending the 31st of December.

8. The floor and such parts of the walls and ceiling as are not limewashed and the benches shall be cleansed once a week.

9. If the factory or workshop is situated in a dwelling house the work of file cutting shall not be carried on in any room which is used as a sleeping place or for cooking or eating meals.

10. Every file cutter shall when at work wear a long apron reaching from the shoulders and neck to below the knees. The apron shall be kept in a cleanly state.

11. A copy of these regulations and an abstract of the provisions of the Factory and Workshop Act, 1901, shall be kept affixed in the factory or workshop in a conspicuous place.

12. It shall be the duty of the occupier to carry out Regulations 1, 2, 3, 4, 6, 7, and 11; except that, in any room in a tenement factory or tenement workshop which is let to more than one occupier, it shall be the duty of the owner to carry out these regulations, except the last clause of Regulation 6, which shall be carried out by the occupiers.

It shall be the duty of the occupier or occupiers to carry out Regulation 8.

It shall be the duty of the occupier or occupiers and of every workman to observe Regulations 5, 9, and 10.

These regulations shall come into force on the 1st day of September, 1903.

A. AKERS-DOUGLAS,
One of His Majesty's Principal Secretaries of State.

HOME OFFICE, *Whitehall, 19th June, 1903.*

Special Rules for the Bottling of Aerated Water.

(Form 273—A 1-3-01.)

Duties of occupiers.

1. They shall provide all bottlers with face guards, masks, or veils of wire gauze.

They shall provide all wirers, sighters, and labelers with face guards, masks, or veils of wire gauze, or goggles.

2. They shall provide all bottlers with full-length gauntlets for both arms.

They shall provide all wirers, sighters, and labelers with gauntlets for both arms, protecting at least half of the palm and the space between the thumb and forefinger.

3. They shall cause all machines for bottling to be constructed, so placed, or so fenced, as to prevent as far as possible, during the operation of filling or corking, a fragment of a bursting bottle from striking any bottler, wirer, sighter, labeler, or washer.

Duties of persons employed.

4. All bottlers shall, while at work, wear face guards, masks, or veils of wire gauze.

All wirers, sighters, and labelers shall, while at work, wear on both arms gauntlets protecting at least half of the palm and the space between the thumb and forefinger; except labelers when labeling bottles standing in cases.

Arthur Whitelegge,
H. M. Inspector of Factories.

August, 1897.

These rules are required to be posted up in conspicuous places in the factory or workshop to which they apply, where they may be conveniently read by the persons employed therein, who are bound to observe any special rules, are liable to a penalty of five pounds [$24.33]. Occupiers of factories and workshops, and persons employed therein, who are bound to observe any special rules, are liable to penalties for non-compliance (Factory and Workshop Act, 1891, sections 9 and 11).

The employer is required to provide the articles mentioned in the rules, and to take all reasonable precautions to the best of his power to enforec their use, but the responsibility for the actual wearing of them rests with the person employed.

Spinning by Self-Acting Mules.

Whereas certain machinery used in the process of spinning in textile factories, and known as self-acting mules, has been certified in pursuance of section 79 of the Factory and Workshop Act, 1901, to be dangerous to life and limb:

I hereby, in pursuance of the powers conferred on me by that act, make the following regulations, and direct that they shall apply to all factories or parts thereof in which the process of spinning by means of self-acting mules is carried on:

1. In these regulations the term "minder" means the person in charge of a self-acting mule for the time being.

2. Save as hereinafter provided it shall be the duty of the occupier of a factory to observe Part I of these regulations; provided that it shall be the duty of the owner (whether or not he is one of the occupiers) of a tenement factory to observe Part I of these regulations, except so far as relates to such parts of the machinery as are supplied by the occupier.

It shall be the duty of the persons employed to observe Part II of these regulations, but it shall be the duty of the occupier, for the purpose of enforcing their observance, to keep a copy of the regulations in legible characters affixed in every mule room, in a conspicuous position where they may be conveniently read.

PART I.—*Duties of occupiers.*

3. After January 1st, 1906, the following parts of every self-acting mule shall be securely fenced as far as reasonably practicable, unless it can be shown that by their position or construction they are equally safe to every person employed as they would be if securely fenced.

(*a*) Back shaft scrolls and carrier pulleys and draw band pulleys.
(*b*) Front and back carriage wheels.
(*c*) Faller-stops.
(*d*) Quadrant pinions.
(*e*) Back of headstocks, including rim pulleys and taikng-in scrolls.
(*f*) Rim band tightening pulleys, other than plate wheels, connected with a self-acting mule erected after January 1st, 1906.

PART II.—*Duties of persons employed.*

4. It shall be the duty of the minder of every self-acting mule to take all reasonable care to ensure:

(*a*) That no child cleans any part or under any part thereof whilst the mule is in motion by the aid of mechanical power.

(*b*) That no woman, young person, or child works between the fixed and traversing parts thereof whilst the mule is in motion by the aid of mechanical power.

(*c*) That no person is in the space between the fixed and traversing parts thereof unless the mule is stopped on the outward run.

5. No self-acting mule shall be started or restarted except by the minder or at his express orders, nor until he has ascertained that no person is in the space between the fixed and traversing parts thereof.

A. AKERS-DOUGLAS,
One of His Majesty's Principal Secretaries of State.

HOME OFFICE, *Whitehall, 17th October, 1905.*

LOADING GOODS ON DOCKS AND WHARVES.

Whereas the processes of loading, unloading, moving, and handling goods in, on, or at any dock, wharf, or quay, and the processes of loading, unloading, and coaling any ship in any dock, harbor, or canal have been certified in pursuance of section 79 of the Factory and Workshop Act, 1901, to be dangerous:

I hereby, in pursuance of the powers conferred on me by that act make the following regulations for the protection of persons employed in the processes or in any of them, and direct that they shall apply to all docks, wharves, quays, and ships as aforesaid.

These regulations shall come into force on the 1st of January, 1905, except that so much of Regulations 6 and 8 as require structural alterations shall come into force on the 1st of January, 1908.

Nothing in Parts II to VI, inclusive, of these regulations shall apply to the unloading of fish from a vessel employed in the catching of fish.

The secretary of state may by order in writing exempt from all or any of the regulations and for such time and subject to such conditions as he may prescribe any docks, wharves, or quays in respect of which application for such exemption shall have been made to him by the department of agriculture and technical instruction for Ireland or by the congested districts board for Ireland.

Definitions.

In these regulations:

"Processes" means the processes above mentioned; or any of them.

"Person employed" means a person employed in the above processes or any of them.

"Shallow canal" includes any of the following parts of a canal, canalized river, montidal river, or inland navigation:

(*a*) Any part having no means of access to tidal waters except through a lock not exceeding ninety feet in length;

(*b*) Any part not in frequent use for the processes; and
(*c*) Any part at which the depth of water within fifteen feet of the edge does not ordinarily exceed five feet.

Duties.

It shall be the duty of the person having the general management and control of a dock, wharf, or quay to comply with Part I of these regulations; provided that if any other person has the exclusive right to occupation of any part of the dock, wharf, or quay, and has the general management and control of such part the duty in respect of that part shall devolve upon that other person; and further provided that this part of these regulations shall no apply to any shallow canal.

It shall be the duty of the owner, or officer in charge of a ship to comply with Part II of these regulations.

It shall be the duty of the owner of machinery or plant used in the processes, and in the case of machinery or plant carried on board a ship not being a ship registered in the United Kingdom it shall also be the duty of the master of such ship, to comply with Part III of these regulations.

It shall be the duty of every person who by himself, his agents, or workmen carries on the processes, and of all agents, workmen, and persons employed by him in the processes, to comply with Part IV of these regulations.

It shall be the duty of all persons, whether owners, occupiers, or persons employed, to comply with Part V of these regulations.

Part VI of these regulations shall be complied with by the persons on whom the duty is placed in that part.

PART I.

1. The following parts of every dock, wharf, or quay, as far as is practicable, having regard to the traffic and working, be securely fenced so that the height of the fence shall be in no place less than two feet six inches, and the fencing shall be maintained in good condition ready for use.

(*a*) All breaks, dangerous corners, and other dangerous parts of edges of a dock, wharf, or quay.

(*b*) Both sides of such footways over bridges, caissons, and dock gates as are in general use by persons employed, and each side of the entrance at each end of such footway for a sufficient distance not exceeding five yards.

2. Provision for the rescue from drowning of persons employed shall be made and maintained, and shall include:

(*a*) A supply of life-saving appliances, kept in readiness on the wharf or quay, which shall be reasonably adequate having regard to all the circumstances.

3. All places in which persons employed are employed at night, and any dangerous parts of the regular road or way over a dock, wharf, or quay, forming the approach to any such place from the nearest highway, shall be efficiently lighted.

Provided that the towing path of a canal or canalized river shall not be deemed to be "an approach" for the purpose of this regulation. z

PART II.

4. If a ship is lying at a wharf or quay for the purpose of loading or unloading or coaling there shall be means of access for the use of persons employed at such times as they have to pass from the ship to the shore or from the shore to the ship as follows:

(*a*) Where a gangway is reasonably practicable a gangway not less than 22 inches wide, properly secured, and fenced throughout on each side to a clear height of two feet nine inches by means of upper and lower rails, taut ropes or chains, or by other equally safe means.

(*b*) In other cases a secure ladder of adequate length.

Provided that nothing in this regulation shall be held to apply to cargo stages or cargo gangways, if other proper means of access is provided in conformity with these regulations.

Provided that as regards any sailing vessel not exceeding 250 tons net reg-

istered tonnage and any steam vessel not exceeding 150 tons gross registered tonnage this regulation shall not apply if and while the conditions are such that it is possible without undue risk to pass to and from the ship without the aid of any special appliances.

5. If a ship is alongside any other ship, vessel, or boat, and persons employed have to pass from one to the other, safe means of access shall be provided for their use, unless the conditions are such that it is possible to pass from one to the other without undue risk without the aid of any special appliance.

If one of such ships, vessel, or boats is a sailing barge, flat, keel, lighter or other similar vessel of relatively low free board the means of access shall be provided by the ship which has the higher free board.

6. If the depth from the top of the coamings to the bottom of the hold exceeds six feet there shall be maintained safe means of access by ladder or steps from the deck to the hold in which work is being carried on, with secure hand-hold and foot-hold continued to the top of the coamings.

In particular such access shall not be deemed to be safe:

(*a*) Unless the ladders between the lower decks are in the same line as the ladder from the main deck, if the same is practicable having regard to the position of the lower hatchway or hatchways.

(*b*) Unless the cargo is stowed sufficiently far from the ladder to leave at each rung of the ladder sufficient room for a man's feet.

(*c*) If there is not room to pass between a winch and the coamings at the place where the ladder leaves the deck.

(*d*) If the ladder is recessed under the deck more than is reasonably necessary to keep the ladder clear of the hatchway.

7. When the processes are being carried on between one hour after sunset and one hour before sunrise (*a*) the places in the hold and on the decks where work is being carried on, and (*b*) the means of access provided in pursuance of Regulations 4 and 5, shall be efficiently lighted, due regard being had to the safety of the ship and cargo, of all persons employed and of the navigation of other vessels and to the duly approved by-laws or regulations of any authority having power by statute to make by-laws or regulations subject to approval by some other authority.

8. All iron fore and aft beams and thwart ship beams used for hatchway covering shall have suitable gear for lifting them on and off without it being necessary for any person to go upon them to adjust such gear.

PART III.

9. All machinery and chains and other gear used in hoisting or lowering in connection with the processes shall have been tested, and shall be periodically examined. All such chains shall be effectually softened by anneaing or firing when necessary, and all half-inch or smaller chains in general use shall be so annealed or fired once in every six months.

If the chains are part of the outfit carried by a seagoing ship it shall be a sufficient compliance with this regulation as regards softening by annealing or firing of half-inch or smaller chains, that no such chains shall be used unless they have been so annealed or fired within six months preceding.

As regards chains, the safe-loads indicated by the test the date of last annealing, and any other particulars prescribed by the secretary of state, shall be entered in a register which shall be kept on the premises, unless some other place has been approved in writing by the chief inspector.

10. All motors, cog-wheels, chain and friction gearing, shafting and live electric conductors used in the processes shall (unless it can be shown that by their position and construction they are equally safe to every person employed as they would be if securely fenced) be securely fenced so far as is practicable without impeding the safe working of the ship without infringing any requirement of the board of trade.

11. The lever controlling the link motion reversing gear of a crane or winch used in the processes shall be provided with a suitable spring or other locking arrangement.

12. Every shore crane used in the processes shall have the safe-load plainly marked upon it, and if so constructed that the jib may be raised or lowered

either shall have attached to it an automatic indicator of safe-loads or shall have marked upon it a table showing the safe-loads at the corresponding inclinations of the jib.

13. The driver's platform on every crane or tip driven by mechanical power and used in the processes shall be securely fenced, and shall be provided with safe means of access.

14. Adequate measures shall be taken to prevent exhaust steam from any crane or which obscuring any part of the decks, gangways, wharf, or quay, where any person is employed.

PART IV.

15. No machinery or gear used in the processes, other than a crane, shall be loaded beyond the safe-load; nor a crane, unless secured with the written permission of the owner by plates or chains or otherwise.

No load shall be left suspended from a crane, winch, or other machine unless there is a competent person actually in charge of the machine while the load is so left.

16. A boy under 16 shall not be employed as driver of a crane or winch, or to give signals to a driver, or to attend to cargo falls on winch-ends or winch-bodies.

17. Where in connection with the processes goods are placed on a wharf or quay other than a wharf or quay on a shallow canal:

(*a*) A clear passage leading to the means of access to the ship required by Regulation 4 shall be maintained on the wharf or quay; and

(*b*) If any space is left along the edge of the wharf or quay, it shall be at least three feet wide and clear of all obstructions other than fixed structures, plant and appliances in use.

18. No deck-stage or cargo-stage shall be used in the processes unless it is substantially and firmly constructed, and adequately supported, and, where necessary, securely fastened.

No truck shall be used for carrying cargo between ship and shore on a stage so steep as to be unsafe.

Any stage which is slippery shall be made safe by the use of sand or otherwise.

19. Where there is more than one hatchway, if the hatchway of a hold exceeding seven feet six inches in depth measured from the top of the coamings to the bottom of the hold is not in use and the coamings are less than two feet six inches in height, shall either be fenced to a height of three feet, or be securely covered.

Provided that this regulation shall not apply during meal-times or other temporary interruptions of work during the period of employment.

And provided that until the 1st of January, 1908, the fencing may be the best the circumstances will allow without making structural alteration.

Hatch coverings shall not be used in connection with the processes in the construction of deck or cargo stages, or for any other purpose which may expose them to damage.

20. No cargo shall be loaded by a fall or sling at any intermediate deck unless a secure landing platform has been placed across the hatchway at that deck.

PART V.

21. No person shall, unless duly authorized, or in case of necessity, remove or interfere with any fencing, gangway, gear, ladder, life-saving means or appliances, lights, marks, stages, or other things whatsoever, required by these regulations to be provided.

22. The fencing required by Regulation 1 shall not be removed except to the extent and for the period reasonably necessary for carrying on the work of the dock or ship, or for repairing any fencing. If removed it shall be restored forthwith at the end of that period by the persons engaged in the work that necessitated its removal.

PART VI.

23. No employer of persons in the processes shall allow machinery or gear

to be used by such persons in the processes that does not comply with Part III of these regulations.

24. If the persons whose duty it is to comply with Regulations 4, 5, and 7 fail so to do, then it shall also be the duty of the employers of the persons employed for whose use the means of access and the lights are required to comply with the said regulation within the shortest time reasonably practicable after such failure.

25. The certificate of the ship's register and any other certificate or register referred to in these regulations shall be produced by the person in charge thereof on the application of any of H. M. inspectors of factories.

A. AKERS-DOUGLAS,
One of His Majesty's Principal Secretaries of State.

HOME OFFICE, *Whitehall, 24th October, 1904.*

FACTORY ENGINES AND CARS.

Whereas the use of locomotives, wagons, and other rolling stock on lines of rail or sidings in any factory or workshop or any place to which the provisions of section 79 of the Factory and Workshop Act, 1901, are applied by that act or on lines of rail or sidings used in connection with any factory, or workshop or any place as aforesaid, and not being part of a railway within the meaning of the Railway Employment (preventions of accidents) Acts, 1900, has been certified in pursuance of the said section to be dangerous:

I hereby in pursuance of the powers conferred upon me by that act make the following regulations and direct that they shall apply to all places before mentioned.

These regulations shall come into force on the 1st day of January, 1907, except Regulations 1, 2, and 22, which shall come into force on the 1st day of January, 1908.

Subject to the exemptions below, it shall be the duty of—

(*i*) The occupier of any factory or workshop and any place to which any of the provisions of the Factory and Workshop Act, 1901, are applied, and

(*ii*) The occupier of any line of rails or sidings used in connection with a factory or workshop, or with any place to which any of the provisions of the Factory and Workshop Act, 1901, are applied,

to comply with Part I of these regulations.

And it shall be the duty of every person who by himself, his agents or workmen, carries on any of the operations to which these regulations apply, and of all agents, workmen and persons employed to comply with Part II of these regulations.

And it shall be the duty of every person who by himself, his agents, or workmen, carries on any of the operations to which these regulations apply, to comply with Part III of these regulations.

In these regulations:

Line of rails means a line of rails or sidings for the use of locomotives or wagons except such lines as are used exclusively for (*a*) a gantry crane or traveling crane, or (*b*) any charging machine or other apparatus or vehicle used exclusively in or about any actual process of manufacture.

Wagon includes any wheeled vehicle or non-self-moving crane on a line of rails.

Locomotive includes any wheeled motor on a line of rails used for the movement of wagons and any self-moving crane.

Gantry means an elevated structure of wood, masonry, or metal, exceeding 6 feet in height and used for loading or unloading, which carries a line of rails, whereon wagons are worked by mechanical power.

Nothing in these regulations shall apply to:

(*a*) A line of rails of less than 3 feet gauge, and locomotives and wagons used thereon.

(*b*) A line of rails not worked by mechanical power.

(*c*) A line of rails inside a railway goods warehouse.

(*d*) A line of rails forming part of a mine within the meaning of the Coal Mines Regulation Act, 1887, or of a quarry within the meaning of the Quarries Act, 1894, not being a line of rails within or used solely in connection with any

factory or workshop not incidental to the maintenance or working of the mine or quarry or to the carrying on of the business thereof.

(*e*) Pit banks of mines to which the Metalliferous Mines Regulation Act, 1872, applies, and private lines of rails used in connection therewith.

(*f*) Lines of rails used in connection with factories or workshops, so far as they are outside the factory or workship premises, and used for running purposes only.

(*g*) Wagons not moved by mechanical power.

(*h*) Buildings in course of construction.

(*i*) Explosive factories or workshops within the meaning of the Explosives Act, 1875.

(*j*) All lines and sidings on or used in connection with docks, wharves and quays not forming part of a factory or workshop as defined in section 149 of the Factory and Workshop Act, 1901.

(*k*) Wagon or locomotive building or repairing shops, and all lines and sidings used in connection with such shops if such shops are in the occupation of a railway company within the meaning of the Regulation of Railways Act, 1871.

(l) Depots or car-sheds being parts of tramways or light railway undertakings authorized by Parliament, and used for the storage, cleaning, inspection or repair of tramway cars or light railway cars.

PART I.

1. Point rods and signal wires in such a position as to be a source of danger to persons employed shall be sufficiently covered or otherwise guarded.

2. Ground levers working points shall be so placed that men working them are clear of adjacent lines, and shall be placed in a position parallel to the adjacent lines, or in such other position, and be of such form as to cause as little obstruction as possible to persons employed.

3. Lines of rails and points shall be periodically examined and kept in efficient order, having regard to the nature of the traffic.

4. Every gantry shall be properly constructed and kept in proper repair. It shall have a properly fixed structure to act as a stop-block at any terminal point; and at every part where persons employed have to work or pass on foot there shall be a suitable footway, and if such footway is provided between a line of rails and the edge of the gantry the same shall so far as is reasonably practicable, having regard to the traffic and working, be securely fenced at such a distance from the line of rails as to afford a reasonably sufficient space for such persons to pass in safety between the fence and a locomotive, wagon or load on the line of rails.

5. Coupling poles or other suitable mechanical appliances shall be provided where required for the purpose of Regulation 11.

6. Proper sprags and scrotches when required shall be provided for the use of persons in charge of the movement of wagons.

7. Where during the period between one hour after sunset and one hour before sunrise, or in foggy weather, shunting or any operations likely to cause danger to persons employed are frequently carried on, efficient lighting shall be provided either by hand lamps or stationary lights as the case may require at all points where necessary for the safety of such persons.

8. The mechanism of a capstan worked by power and used for the purpose of traction of wagons on a line of rails shall be maintained in efficient condition and if operated by a treadle such treadle shall be tested daily before use.

PART II.

9. When materials are placed within 3 feet of a line of rails and persons employed are exposed to risk of injury from traffic by having to pass on foot over them or between them and the line such material shall, as far as reasonably practicable, be so placed as not to endanger such persons, and there shall be adequate recesses at intervals of not more than 20 yards where the materials exceed that length.

10. No person shall cross a line of rails by crawling or passing underneath a train or wagons thereon where there may be a risk of danger from traffic.

11. Locomotives or wagons shall wherever it is reasonably practicable without structural alterations be coupled or uncoupled only by means of a coupling pole or other suitable mechanical appliance, except where the construction of locomotives or wagons is such that coupling or uncoupling can be safely and conveniently performed without any part of a man's body being within the space between the ends or buffers of one locomotive or wagon and another.

12. Sprags and scrotches shall be used as and when they are required.

13. Wagons shall not be moved or be allowed to be moved on a line of rails by means of a prop or pole, or by means of towing by a rope or chain attached to a locomotive or wagon moving on an adjacent line of rails when other reasonably practicable means can be adopted; provided that this shall not apply to the movement of ladles containing hot material on a line of rails in front of and adjacent to a furnace.

In no case shall props be used for the above purpose unless made of iron, steel, or strong timber, hooped with iron, to prevent splitting.

14. Where a locomotive pushes more than one wagon, and risk of injury may thereby be caused to persons employed, a man shall, wherever it is safe and reasonably practicable, accompany or precede the front wagon or other efficient means shall be taken to obviate such risk.

Provided that this regulation shall not apply to the following:

(*a*) Fly shunting.

(*b*) Movement of wagons used for conveyance of molten or hot material or other dangerous substance.

15. No person shall be upon the buffer of a locomotive or wagon in motion unless there is a secure handhold and shall not stand thereon unless there is also a secure footplace; nor shall any person ride on a locomotive or wagon by means of a coupling pole or other like appliance.

16. No locomotive or wagon shall be moved on a line of rails until warning has been given by the person in charge to persons employed whose safety is likely to be endangered.

Provided that this regulation shall not apply to a self-moving crane within a building or to a charging machine or other vehicle so long as it is used in or about any actual process of manufacture.

17. Where persons employed have to pass on foot or work, no locomotive or wagon shall be moved on a line of rails during the period between one hour after sunset and one hour before sunrise, or in foggy weather, unless the approaching end, wherever it is safe and reasonably practicable, is distinguished by a suitable light or accompanied by a man with a lamp.

Provided that this regulation shall not apply to the movement of locomotives or wagons within any area which is efficiently lighted by stationary lights.

18. The driver in charge of a locomotive, or a man preceding it on foot, shall give an efficient sound signal as a warning on approaching any level crossing over a line of rails regularly used by persons employed, or any curve where sight is intercepted, or any other point of danger to persons employed.

19. A danger signal shall be exhibited at or near the ends of any wagon or train of wagons undergoing repair wherever persons employed are liable to be endangered by an approaching locomotive or wagon.

20. (*a*) The space immediately around such capstan as mentioned in Regulation 8 shall be kept clear of all obstruction.

(*b*) Such capstan shall not be set in motion until signals have been exchanged between the man in charge of the capstan and the man working the rope or chain attached to it.

(*c*) No person under 18 years of age shall work such capstan.

21. No person under the age of 18 shall be employed as a locomotive driver, and no person under the age of 16 shall be employed as a shunter.

PART III.

22. All glass tubes or water gauges on locomotives or stationary boilers used for the movement of wagons shall be adequately protected by a covering or guard.

H. J. GLADSTONE,

One of His Majesty's Principal Secretaries of State.

HOME OFFICE, *Whitehall, 24th August, 1906.*

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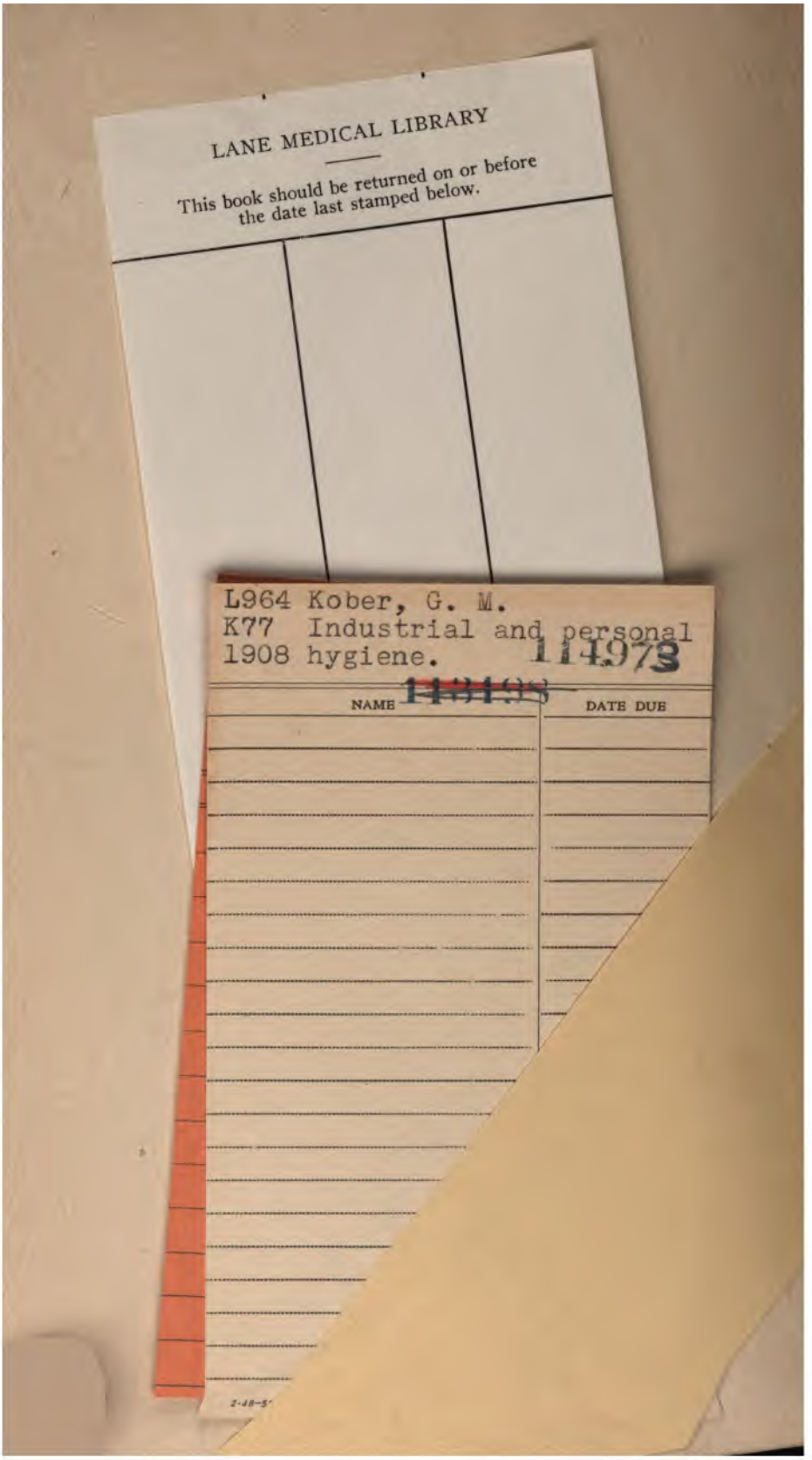
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